

A survey of the policy landscape on street connectivity

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1 Introduction

The process of urban expansion deserves significant policy attention. According to the United Nations, “55% of the world’s population lives in urban areas, a proportion that is expected to increase to 68% by 2050” (United Nations, 2018). Population and economic growth have strained the capacity of urban centers, necessitating new development -- and with it, new road networks.

The imminence of the climate crisis demands that urban expansion occur in a sustainable manner. Goal 11 of the United Nation’s Sustainable Development Goals is to “make cities and human settlements inclusive, safe, resilient and sustainable” (United Nations, 2016b). The problems arising from urban sprawl are well-documented: congestion and pollution bring down the quality of life for residents. A dimension of sprawl that has received less attention, but is very critical nonetheless, is the street network layout. Poor street connectivity leads to greater automobile dependence, higher energy use and increased carbon emissions (Barrington-Leigh and Millard-Ball, 2019). Improving transport accessibility, reducing cities’ adverse environmental impact and increasing resilience to climate change are all achievable with the adoption of a more connected street network. Combatting sprawl is increasingly on the agenda of governments around the world. The 2016 UN Conference on Housing and Sustainable Urban Development (Habitat III) reflects a greater awareness of this problem and acknowledges the need to coordinate policy answers to urban sprawl.

In this paper, I explore how Canada, the United Kingdom, Ghana, South Africa and the Philippines have made plans for urban development. In particular, the spatial policies (in the form of plans and guidelines) that address street network connectivity are of interest to this survey.

2 Review on Planning Systems

There have been various attempts to categorize planning policies and systems, albeit mostly from a European perspective. Newman and Thornley famously identified five “planning families” in Europe based on geography (Hirt, 2015). The Commission of European Communities Compendium of Spatial Planning identifies 4 main traditions of spatial planning: regional economic planning approach, comprehensive integrated approach, land-use management and urbanism (Silva and Acheampong, 2015). While we can identify similarities across planning systems and strive to classify them in some way, it becomes apparent from this survey that each country’s urban policy is driven by the distinctive challenges it faces and its unique political constraints. As planning is mostly decided upon at the local level, it is also possible for significant variation to arise even within a country.

The OECD has reported on the land-use systems (OECD, 2017a) and urban policies (OECD, 2017b) of its 35 member countries, and 110 countries have submitted national reports for the UN Habitat III Conference. But there is little literature that provides a unified assessment of urban policy around the world, and as far as I am aware, no consolidated

database of land-use policies. The granularity of land-use plans also implies a vast quantity of such documents -- meaning it is impossible to qualitatively comb through them all. This makes it difficult to make conclusive comparisons between policy choices in each country, and about which policies may be more effective in addressing sprawl. There may be no single “best practice” for planning policies, but it is still interesting to consider what policy efforts have been made in addressing the problem.

In this section, I contextualize and offer an overview of urban policy in Canada, the United Kingdom, Ghana, South Africa and the Philippines. The purpose of these case studies is to understand what policy attention there exists with regard to street connectivity, and to identify the structure of decision-making behind it.

2.1 Canada

Although Canada possesses a vast land mass, built-up area only makes up 0.1% of the country’s total area (Pope, 2016). The pattern of urban expansion is constrained by geography, with high intensification within urban centers, which have mostly been built up. New development occurs on the periphery of major urban centers, such as in Brampton (a city lying outside of the Greater Toronto Area).

Canada has a decentralized planning structure, with no national plan to guide urban development and most decisions taking place at the local government level. According to the OECD, Canada has a “formally hierarchical” planning system . This means that every level of government involved in the planning process is legally bound to any guidelines issued by the institutions above it, and has the authority to provide binding regulations to lower levels of government (OECD, 2017a).

The constitution places land use planning under the jurisdiction of provincial governments. However, there exist some special cases where the federal government takes charge of planning, such as in national parks (OECD, 2017a). Because of its decentralized nature, there is significant variation in how urban planning is organized across Canada. It is up to provincial governments to delegate planning responsibilities to local governments; the extent of authority that provincial governments possess varies across provinces. In the New Brunswick, Ontario and Alberta, the provincial government is responsible for the *Regional Plan*, while in the rest of Canada this responsibility is delegated to local government (Bulhozer, 2017).

Different provinces have different planning structures. In Alberta, the *Land Use Framework* describes the planning system for the province. The provincial government of Alberta decides on the division of land regions and creates the corresponding land-use plans, since there is no regional level authority. Municipal governments then have to comply with these *Regional Plans* in the formation of their own plans for their jurisdictions (Government of Alberta, 2008).

Meanwhile in Ontario, the planning system is outlined by the *Ontario Planning and Development Act*. The regional, city and community levels of government each prepare an *Official Plan* for their jurisdiction; this document is the key policy instrument for urban planning in Ontario. The provincial government takes a high-level interest in development in the province: the 2005 *Places to Grow Act*, for instance, establishes a framework for developing new areas (Government of Ontario, 2017). The *Official Plans* give local governments a

framework for the creation of by-laws that are more specific to their areas (Bulhozer, 2017). These official plans can be thought of as a constitution, since they effectively set the limits for what local governments can do, especially when it comes to infrastructure projects. Furthermore, the adoption process for a plan is similar to a constitution, as they require input from different stakeholders through public consultations and hearings, and undergo a strenuous amendment procedure (Bulhozer, 2017). This is in contrast to the passing of by-laws.

The most detailed of these plans is the site plan (called *Block Plans* in Ontario), which are map-based and show in detail the proposed land uses and street networks for a specific area. The site plans are subsumed under a district plan (in Ontario, *Secondary Plan*) which provide more detail than *Official Plans*. Cities also have other policies, guidelines and frameworks to govern development apart from the mandatory plan documents. For instance, the city of Brampton in Ontario has its own *Development Design Guidelines*, which are aimed at developers and builders to ensure that they comply with a “minimum design standard” in line with the city’s (and by proxy, the region’s) principles of good urban design (City of Brampton, 2009).

2.2 United Kingdom

The ongoing housing crisis in the United Kingdom has made urban expansion an important issue. There is a severe shortage of affordable housing all over the country, with an estimated backlog of 2 million households not having their needs met (Barton and Wilson, 2018). In 2015, the government announced its intention to build 300,000 new homes every year (Barton and Wilson, 2018). As many urban areas have already been built up, new developments have mostly sprung up on brownfield lands and, to a lesser extent, on greenfield lands (Glenigan, 2019). The urban encroachment of the countryside has been met with criticism, notably from citizen groups such as the Campaign to Protect Rural England. This highlights the need for a sustainable form of urban expansion, which can be achieved through conscientious street network planning.

The UK’s constituent countries -- England, Northern Ireland, Scotland and Wales -- each have a national level plan. England’s national plan, determined by the Ministry of Housing, Communities and Local Government, is the *National Planning Policy Framework (NPPF)*. This document guides the formulation of development policy at subordinate levels, but is not legally binding (Government of Great Britain and Ministry of Housing, Communities and Local Government, 2019). The *Planning Act*, on the other hand, is legislation that sets out the scope of development that the national government is responsible for. With the exception of nationally significant infrastructure projects (e.g. airports, wastewater treatment plants and reservoirs), planning decisions are left to local jurisdictions and new developments are subject to the processes of local government.

Regional governments operate below the national government. Planning policy is generally not enacted at this level, with the exception of London, which has a special *London Plan* governing the development strategy of the Greater London Area (OECD, 2017a).

An intermediate level of government, the county, exists before the local level. The UK has 27 county councils, governing a total of 389 local authorities, which administer areas such as cities, boroughs, or townships. Counties generally do not make development planning

decisions, noting that “planning permission for residential, industrial or commercial developments are dealt with by [the] local district or borough council” (Warwickshire County Council, 2019). There are some sector-specific exceptions -- the Gloucestershire County Council, for instance, makes policy regarding mineral works and associated development, and the disposal of waste (Gloucestershire County Council, 2019).

The local government has to formulate a statutory planning document. This local plan is the principal policy instrument that governs how urban development occurs, addressing a broad scope of issues, such as housing, transportation and the economy, in detail specific to that district. *Neighbourhood Plans*, introduced to the English planning system with the 2011 *Localism Act*, aim to further devolve the planning process. They give some autonomy to smaller representative groups, such as town and parish councils (Tewkesbury Borough Council, 2019) or self-organized groups of citizens (OECD, 2017a). The *Neighbourhood Plan* can further designate new land for development, so long as it conforms to guidelines in the *NPPF* (OECD, 2017a). *Neighbourhood Plans*, upon approval, are considered along with the *Local Plan/Core Strategy* as part of the district’s statutory development plan. Interestingly, the planning of the local road network does not automatically fall under the responsibility of the local government; rather, it belongs to the local highway authority. For instance, in the case of the Tewkesbury Borough, the Gloucestershire County council governs the road network of the region. The *Local Transport Plan* of Gloucestershire describes in significant detail the plans for transit systems, highways, and the unclassified road network, which in urban areas refers to “residential or industrial interconnecting roads, residential loop roads or cul-de-sacs” (Gloucestershire County Council, 2017).

Decentralization implies that local governments need to coordinate with each other to govern areas that cross administrative borders. Urban expansion as a result of the housing crisis can spill over into neighboring towns -- Tewkesbury borders the more densely populated Gloucester and Cheltenham, and expects to be affected by the growth of those boroughs (Gloucester City Council et al., 2017). Hence, the Tewkesbury borough also adheres to a *Joint Core Strategy*, formulated with the city of Gloucester and Cheltenham borough. The *JCS* provides a common direction for the *Local Plans* in these 3 districts, acknowledging the interconnectedness of the areas.

2.3 Ghana

Economic growth over the past 3 decades in Ghana has contributed to its rapid urbanization, with urban centers developing in the Ashanti and Greater Accra regions (World Bank, 2015). Urbanization has outpaced the rate at which the government can respond to it -- urban sprawl has become an acute problem in Ghana, with informal settlements springing up where there is housing provision lags behind.

Development has been uneven across the country, making urban-rural connectivity a pressing issue (Government of Ghana and Ministry of Local Government and Rural Development, 2015). The connectivity challenges are unique for these different settings. Traffic congestion is a big problem in urban areas, while suburban and rural areas suffer from an underdeveloped road network (Government of Ghana and Ministry of Local Government and Rural Development, 2015). Economic and population growth is expected to increase average traffic volume by 2.5 times between 2016 and the end of 2035 (Government of Ghana, 2017).

The government plans to build more roads to provide the capacity needed to support the rising demand. As street networks continue to be laid down, how much consideration there is of connectivity will have important implications.

The national direction for urban development is relatively new, but well-articulated through the *National Urban Policy (NUP)* (adopted in 2012) and the *National Spatial Development Framework* (adopted in 2013). The *NUP* aims to “promote a sustainable, spatially integrated and orderly development of urban settlements with adequate housing, infrastructure and services, efficient institutions, and a sound living and working environment for all people to support the rapid socio-economic development of Ghana” (Government of Ghana and Ministry of Local Government and Rural Development, 2015). Ghana is formally hierarchical; the *National SDF* is the principle document guiding all development in the country. This ensures that the national vision for development is propagated down to the local levels (World Bank, 2015). Ghana has a three-tier planning system, comprising a *Spatial Development Framework (SDF)* as an over-arching strategic document, a *Structure Plan* as a zoning guide for more specific administrative areas (namely towns, cities and rural settlements), and finally *Local Plans* which deal with developmental planning in a more focused area (Government of Ghana and Ministry of Local Government and Rural Development, 2015). There are also other plans outside of this planning system that guide the organization of Ghana’s urban form, such as the *Ghana Infrastructure Plan*.

Regional governments also prepare a *Regional SDF* that informs the preparation of district-level *SDFs* in that region. The plan may also receive input from international actors, such as in the Western Region. The Western Region is a participant of Norway’s Oil for Development Program, and Norwegian interest in the region is evident in its advisory role in the preparation of their *SDF* (Government of Ghana and Town et al., 2012).

In addition to the *SDF*, districts also draw up legally binding *Structure Plans* and *Local Plans*, which govern planning to the smallest spatial level, the individual plots (Government of Ghana and Town et al., 2012). These are complemented by the *Medium Term Development Plan (MTDP)*, which outline the implementation of the overall spatial strategy (Government of Ghana, 2016). In practice, however, *MTDPs* serve more as a report and fail in proposing actionable spatial plans (Government of Ghana, 2016).

Ghana has moved towards decentralization, starting with the *National Decentralization Policy Framework* in 2010. Decentralization was described as a “necessity” in response to the uneven pace of development between urban centers and elsewhere (Government of Ghana, 2016). The decentralization in administrative planning, spatial planning, and local economic development has been beneficial. For instance, the distances from public services like hospitals and schools to rural communities has been greatly reduced (Government of Ghana and Ministry of Local Government and Rural Development, 2015). However, the decentralization process has also been spotty -- local governments may have been given the responsibility of planning, but fiscal and technical resources still remain centralized, constraining local implementation (Government of Ghana and Ministry of Local Government and Rural Development, 2015).

2.4 South Africa

South Africa is experiencing rapid urbanization -- in the previous decade, 63% of the country's population growth occurred in only 8 cities (Government of South Africa and Ministry of Human Settlements, 2014), putting a significant strain on the capacity of those urban centers. On top of dealing with the problems arising from urban sprawl, urban planning in South Africa has to deal with the complicated aftermath of Apartheid. During that era, spatial planning was exclusionary by design: black communities were pushed to the urban fringes and their towns did not receive as much infrastructure investment (Government of South Africa and Ministry of Human Settlements, 2014). The effects of that disconnectedness can still be seen today.

National-level policy governing urban development in South Africa is relatively new -- the *Integrated Urban Development Framework* was only adopted in 2014. The *IUDF* specifically addresses the management of cities and urban growth. It was formulated as an answer to the UN's Sustainable Development Goal on "Making cities and human settlements inclusive, safe, resilient and sustainable", and extends the pre-existing *National Development Plan (NDP)* (Republic of South Africa and Ministry of Cooperative Governance and Traditional Affairs, 2016). Another important policy document is the *Spatial Planning and Land-Use Management Act (SPLUMA)*, the spatial accompaniment to the *NDP* (Government of South Africa and Ministry of Human Settlements, 2014). The *SPLUMA* outlines the planning system and planning expectations of each level of government, including development principles, norms and standards that must guide spatial planning (Republic of South Africa and Minister of Rural Development and Land Reform, 2012).

Much like Canada, land planning is delegated to the local level, rather than managed by the central government. This jurisdiction is declared in the country's constitution itself, where it states that "municipalities are where apartheid's settlement geography must be confronted, where the trade-offs involved in addressing poverty and investing in growth must be made" (Government of South Africa and Ministry of Human Settlements, 2014). As prescribed by the *SPLUMA*, provincial and municipal governments must prepare *Spatial Development Frameworks* that conform to the national framework, while for regional governments, a spatial plan is optional.

South Africa is strongly decentralized, with the *Municipal Systems Act* further requiring municipalities to issue an *Integrated Development Plan*. Larger municipalities also prepare a *Built Environment Performance Plan (BEPP)*, which provides policy direction for transport, roads, infrastructure investments and human settlements. The autonomy conferred on municipalities gives them more leeway in crafting policy unique to their regions. For example, Cape Town has a *Transit-Oriented Development Strategic Framework (TODSF)* to solve the problem of disconnectedness with poor, peri-urban communities. Transit-oriented development is defined as the following (City of Cape Town and Transport and Urban Development Authority, 2016):

TOD is about changing, developing and stimulating the built form of the city in such a way that the movement patterns of people and goods are optimized to create urban efficiencies and enable social equality and economic development.

Districts within municipalities further prepare *District Spatial Development Plans*, which

“seek to translate the *Municipal Spatial Development Framework* at a sub-metropolitan scale” (City of Cape Town, 2012).

A key challenge of the South African planning system is the lack of coordination between the different agencies involved. While the level of planning can be described as “intense”, that different planning documents are not always aligned with each other renders land governance weak and ineffectual (Republic of South Africa and Ministry of Cooperative Governance and Traditional Affairs, 2016). It is this coordination failure that is to blame for the problems of urban sprawl and implementation inconsistency in the country (Government of South Africa and Ministry of Human Settlements, 2014). According to the *NDP*, devolution of power to the local government is the solution to this, as that is where “functions are best administered locally and municipal capacity exists” (Republic of South Africa and National Planning Commission, 2016), especially in the realms of urban housing, public transport, and healthcare. Politically, this may be difficult. The provincial governments, which sit one level above municipalities, are reluctant to let go of power, given their controversial position as a product of the post-Apartheid Interim Constitution (Republic of South Africa and National Planning Commission, 2016).

South Africa, like many African countries, faces a shortage of planners. In 2011, there were 3.33 urban planners per 100,000 people in South Africa. This was better than Ghana’s 0.60 planners to population ratio, or the African continent’s average of 0.89 planners, but still a far cry from the ratio in high-income countries: for example, the UK has 37.63 planners per 100,000 people (Lall et al., 2017).

2.5 Philippines

The pace of economic growth in the Philippines has led to the transformation of its capital, Manila, into a sprawling “megacity”. As economic growth continues, the movement of people and goods within the country is set to intensify (Government of the Philippines, 2016). Geographically, the archipelagic setting of the Philippines complicates connectivity; it is observed that there has been a tendency for planners to prioritize individual motorized transport as an answer rather than developing in a manner that promotes accessibility (Government of the Philippines, 2016). The effect of such policies has become apparent. Congestion, overcrowding, and deteriorating urban air quality are just a few of the challenges plaguing cities in the Philippines.

The problem of urban sprawl in the Philippines can be blamed on weak land governance institutions. A World Bank report written in 2014 called out the lack of an “effective and comprehensive national urban policy” in the Philippines (Baker et al., 2017). The *National Framework for Physical Planning 2001-30 (NFPP)*, issued by the National Economic Development Authority, is not legally binding and there are no mechanisms for its enforcement, meaning that adoption across the country has been inconsistent (Baker et al., 2017). The *Philippine Development Plan (PDP)* strategizes the country’s development in different sectors, but the realm of urban development has been largely overlooked (Baker et al., 2017). Finally, the *National Urban Development and Housing Framework (NUDHF)* aims to guide urban development and housing, but its author, the Housing and Urban Development Coordinating Council (HUDCC), lacks authority as a coordinating body.

The state of national policy appears to have improved considerably since 2014. In their

report for the UN Habitat III Conference, the Filipino government described their country as having a “well-defined framework for land and urban planning” (Government of the Philippines, 2016). The *PDP* and *NUDHF* have since been updated, and there is now a greater focus on urban development that reflects a desire to build sustainable communities. Furthermore, as a direct result of the UN Habitat conferences, the Philippines also now has a *New Urban Agenda*, a high-level strategy document that will unify the existing national policies, bolstering their effectiveness.

The Philippines has 17 administrative regions, and each has its own *Regional Development Plan* and experiences a high degree of autonomy, in light of weak national-level policy. Subsequently, the provincial government can prepare a *Provincial Development Plan*, and local government units (LGUs) in charge of cities, municipalities or ‘barangays’ (the smallest administrative unit in the governance system) issue *Comprehensive Land Use Plans*.

There is one exception to this system -- the metropolitan area surrounding the capital, known as Metro Manila, has a separate administrative body. The Metro Manila Development Authority governs the urban development of the country’s most urbanized and densest region. Metro Manila has a 100% rate of urbanization, and its population density is 62 times that of the national average (Government of the Philippines, 2016). Urban development in the Philippines is rather imbalanced, with much of it happening in the area of Metro Manila and spilling over to neighboring areas in a process known as “peri-urbanization” (Baker et al., 2017). Nonetheless, as the Philippines continues its breakneck pace of economic growth, development in rural areas and new growth centers remains an under-addressed problem.

3 Discussion

Given the extensive negative externalities arising from disconnected street networks, ensuring that new developments have high connectivity should be an important priority for governments. In the absence of targeted policy, it is unlikely that “unregulated markets” will build communities that prioritize high connectivity and density (Lall et al., 2017). On the supply side, private developers have little inclination towards building highly connected developments. This is because higher density implies increased construction costs (for buildings, roads and network utilities) for developers to ensure that the provision of service remains efficient (Lall et al., 2017). Higher street connectivity may also imply that a larger proportion of a plot will have to be designated for roads, meaning that there is a loss of sale-able land (Handy et al., 2003).

On the demand side, negative perceptions of highly-connected communities make residents reluctant to support such developments. There is the misguided perception among some residents that gated communities are safer, and that high connectivity promotes crime by making the passage of strangers through a neighborhood easier (Handy et al., 2003). Grid-like networks may “detract from the character of the neighborhood”, and higher connectivity could also lead to not-in-my-backyard pushback when there is an integration of different income groups (City of Cape Town and Transport and Urban Development Authority, 2016). These attitudes are a challenge for planners in Cape Town, who observed that new residents were wary of transit-oriented developments and preferred to live in suburban areas (City of Cape Town and Transport and Urban Development Authority, 2016).

Planning for street connectivity is thus an delicate balance between the competing interests of private developers, residents and policymakers. Hence, it is important for policy to address street connectivity, so that the goal of sustainable city-building can remain attainable.

3.1 How do policymakers understand connectivity?

The concept of connectivity is loosely defined in planning, with policymakers in different countries and regions choosing to prioritize different aspects of it.

Generally, the reduction of automobile dependence was a common goal for all planners, with the purpose of promoting environmental sustainability and reducing traffic congestion. The link between connectivity and automobile dependence appears to be well understood by policymakers. More specifically, planners were cognizant of how higher connectivity can facilitate public transportation systems and boost other non-car modes of transport such as cycling and walking. The *Gloucester, Cheltenham and Tewkesbury JCS* outlines the following in its Principles of Urban Design (Gloucester City Council et al., 2017):

Ease of movement:

- xv. Promote accessibility to and within an area by foot, bicycle, and public transport and for people with limited mobility prioritizing direct legible routes for these modes.
- xvi. Integrate transport nodes to promote public transport use and provide seamless movement between modes;
- xvii. Increase permeability by avoiding cul-de-sacs and connecting adjacent streets;

Plans from all the countries surveyed stressed the importance of “transit-oriented development”. However, for some planners, the focus was largely on increasing the modal share of alternative transportation rather than paying consideration to the form of the street networks being laid down. An example of such a policy can be seen in the *Philippine Development Plan* for infrastructure (National Economic and Development Authority, 2017b):

With emphasis on improved connectivity and enhanced mobility, multi-modal transport terminals will be established, complete with ancillary facilities to provide smooth transition for passengers and freight from one mode to another.

While such policies do not directly address urban form, they are still important to the goal of reducing vehicular travel. It should be noted that highly connected communities can see a rise in walking and bicycling as forms of transportation, without a fall in car use (Handy et al., 2003). In other words, greater connectivity alone is not enough to discourage automobile dependence, if the alternatives of public transit or pedestrian and cycling networks are not well-established. Hence, these policies are a necessary complement to building highly connected communities. Overall, connectivity was mostly thought of in relation to its downstream effects, leaving a gap for planners at the most local of levels and private developers to fill in for themselves when it comes to the actual physical form of streets.

Planners also differ in the scale at which they view connectivity. Unsurprisingly, local planners plan for intra-community connectivity, with planners at the national or regional level setting some expectations for it too. At these higher levels of planning, there is the additional concern of inter-community connectivity. This is especially evident in the Philippines and Ghana, where planning for connected road systems between urban centers and rural settlements is a priority. Where there is a significant urban-rural imbalance, inter-city connectivity is important in distributing the gains of economic growth from the urban centers around the country. This lack of connectivity is also a source of inefficiency: in Ghana, the costs to transport agricultural products from rural areas to urban centers contributes to 50% to 70% of food prices (Government of Ghana, 2017). Connectivity, a key objective in the overall spatial strategy for the Calabarzon region in the Philippines, is viewed from this inter-city perspective and will be achieved through “defining a large network of centers that physically and functionally integrate the various markets” (National Economic and Development Authority, 2017a).

At this point, it may be useful to introduce some terminology describing the hierarchy of streets. Figure 1 depicts this – streets are differentiated by how accessible they are and what sort of traffic they serve (Handy et al., 2003). Inter-city connectivity is concerned with arterial roads and highways, while intra-community connectivity would be concerned with collector and local roads. The terms vary between countries, but the hierarchy is similar in principle.

For Calabarzon, connectivity between regions is to be achieved through “corridors” -- arterial roads (highways) that originate from urban centers (National Economic and Development Authority, 2017a). Similarly, Ghana plans to expand its network of trunk roads (arterials and highways) and feeder roads (collector streets) to connect the rural north to the more urban south (Government of Ghana and Ministry of Lands et al., 2015). There are also proposals for “ring roads” that bypass urban centers, so that traffic can circumvent congested cities, such as the Accra city-region expressway system. While well-intended, the construction of new roads may have an adverse effect. While it proposes the construction of ring roads and the expansion of the road network, Ghana’s *National Spatial Development Framework* recommends the following to cities (Government of Ghana and Ministry of Lands et al., 2015):

Manage traffic before building new roads: Studies show that new roads frequently generate additional traffic; it is often said that “urban areas cannot build their way out of congestion”. New roads should be considered as the last option only after softer measures are adopted to improve traffic management.

Ghana’s *NSDF* also recommends that cities follow a “grid-based model for urban expansion”. The implementation of this will certainly prove to be difficult, given the current form of the road network. Appendix A shows the current trunk road network for the Ashanti region and its planned extensions. It is apparent that the road network is highly dendritic; while the new projects do improve connectivity to some extent, the original spatial form is largely unchanged. This highlights the path dependency of urban expansion, and reinforces the necessity of long-term planning for sustainable street networks. As a contrast, the major road network for the Peel region can be found in Appendix B. The rectilinear grid ensures high inter-city connectivity between the 3 towns of Mississauga, Brampton and Caledon. These

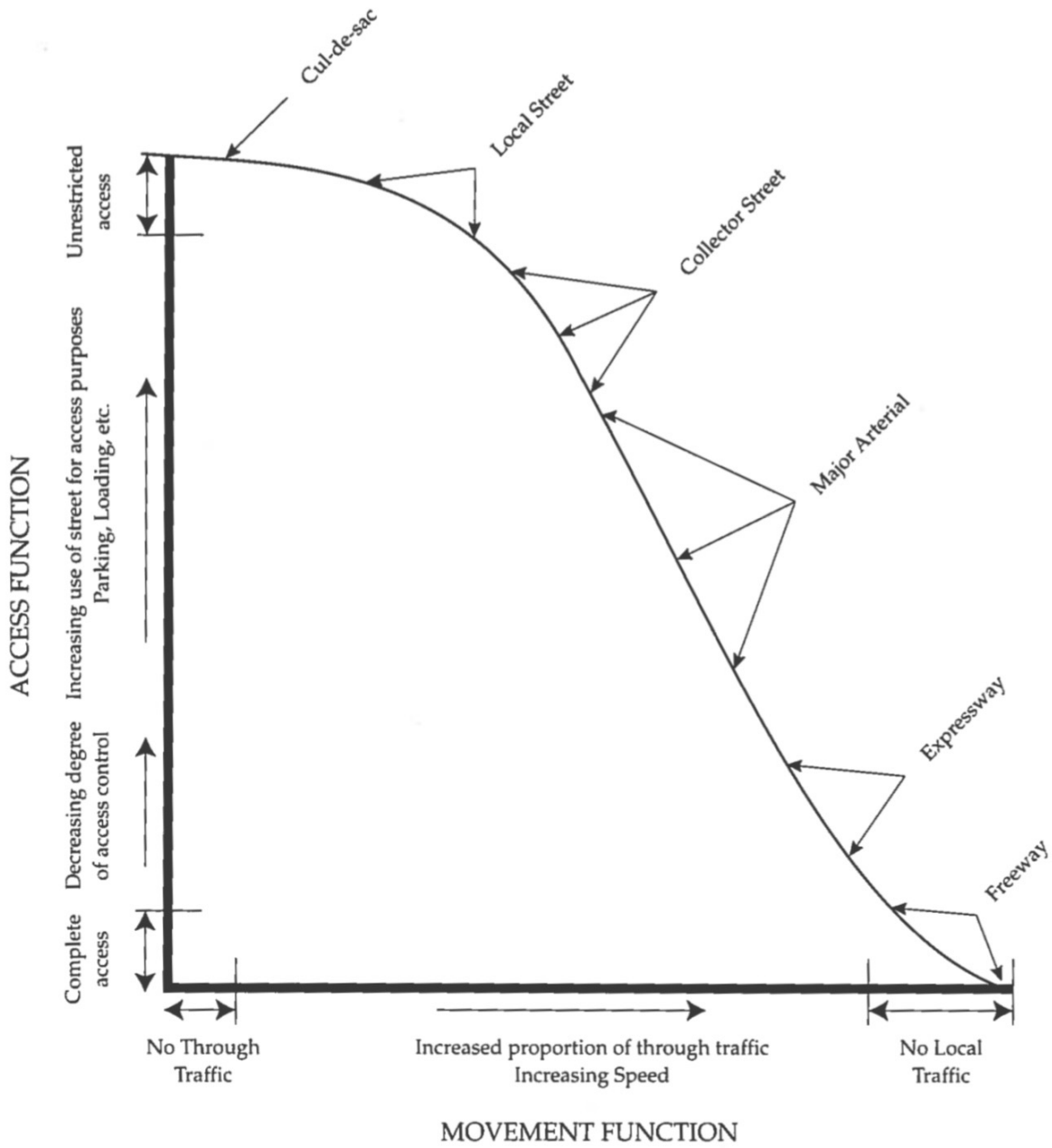


Figure 1: Hierarchy of streets. (Handy et al., 2003)

towns all feature a gridded street network, but it is not always the case that connectivity at a larger spatial scale translates to connectivity at the most local level. Appendix C shows the arterial road network in Zamboanga City, located in Mindanao, Philippines. While the arterials are laid out in a more or less gridded fashion, there is little connectivity at the ‘barangay’ level. Unlike other countries, where plans for street layouts can be found in the district-level plans, ‘barangay’ plans make little mention of street networks and focus more on the maintenance of road conditions.

While connectivity is a desired feature in building a sustainable community, there are cases where disconnectedness is intentional and preferred. Several countries make use of “greenbelts” -- tracts of land left undeveloped -- to curb urban sprawl. Some of the purposes of the Green Belt in England include (Government of Great Britain and Ministry of Housing, Communities and Local Government, 2019):

- a. to check the unrestricted sprawl of large built-up areas;
- b. to prevent neighboring towns merging into one another;
- c. to assist in safeguarding the countryside from encroachment;

A few regions in Ghana have also suggested the implementation of greenbelts to control the growth of urban areas, such as the conurbation of the capital, Accra, with a neighboring city, Tema (Government of Ghana, 2016).

3.2 How is policy implemented?

In general, the 2 main policy approaches are through the implementation of design requirements, or through meeting some quantitative measure such as a connectivity index (Handy et al., 2003). Most of the plans in this survey fall under the former category. Most plans do not make use of a quantitative measure to guide urban development, although the UK’s *NPPF* calls for cities and town centers with active public transit systems to make use of minimum density standards, and to strive towards increasing the average density of residential area (Government of Great Britain and Ministry of Housing, Communities and Local Government, 2019). However, it should be noted that density measures are not a good proxy for quantifying street network connectivity (Barrington-Leigh and Millard-Ball, 2019).

A cohesive and complete policy approach towards connectivity begins at the highest level. We see evidence of this top-down propagation clearly in Brampton’s city plans. The goal of building “complete communities that are compact and transit-supportive” is first declared in the provincial-level *Growth Plan for the Greater Golden Horseshoe*. These phrases are reiterated throughout the plans at the regional and city levels. The Block Plans translate that principle into an implementable spatial requirement (City of Brampton, 2017):

Collector and Local Roads will be designed in such a manner as to support transit to the greatest extent practicable, including the potential use of exclusive transit links and pedestrian walkways where required to reduce pedestrian backtracking to access transit.

This is a product of Canada’s formally hierarchical planning system, and highlights the importance of emphasizing street network connectivity at the highest level of land use planning. Another example of this can be seen in England’s *NPPF*, which lays out the following objective for promoting sustainable transport (Government of Great Britain and Ministry of Housing, Communities and Local Government, 2019):

Transport issues should be considered from the earliest stages of plan-making and development proposals, so that patterns of movement, streets, parking and other transport considerations are integral to the design of schemes, and contribute to making high quality places.

The attention to connectivity, albeit mostly in terms of transit-supportiveness, is evident in the various plans at the county, local and neighborhood levels.

However, this does not necessarily imply that local planners would overlook connectivity in the absence of higher-level attention. In the case of Alberta, the provincially-determined *Lower Athabasca Regional Plan* (Government of Alberta et al., 2012) makes little reference to connectivity, and contains none of the vocabulary describing “complete communities” that is very present in the Ontarian plans. Yet the Municipal Development Plan for Cold Lake, the region’s main city, makes connectivity a priority (City of Cold Lake, 2007):

The City of Cold Lake is committed to maintaining sustainable and environmentally sound development and operating practices ranging from water conservation, energy efficient design, increased walkability, efficient use of resources and infrastructure, and promoting complete and integrated neighborhoods.

Nonetheless, the role of national government in setting the direction for urban planning is significant. The importance of national-level planning has been reiterated at the UN Habitat Conferences: in 1996, the *Habitat Agenda* called for the establishment or improvement of national mechanism “to coordinate actions at all relevant government levels that have an impact on human settlements” (United Nations, 1996); more recently, the 2016 *New Urban Agenda* committed adoptees to “recognize the leading role of national governments, as appropriate, in the definition and implementation of inclusive and effective urban policies and legislation for sustainable urban development” (United Nations, 2016a). The relatively recent adoption of national-level policies in South Africa and Ghana reflects this awareness of the importance of national-level coordination and direction-setting.

At the same time, the institutional power of local governments has also been strengthened through the devolution of administrative and planning authority. In the case studies surveyed, local governments do possess a significant amount of autonomy in undertaking spatial planning within their jurisdictions. Local plans contain the most detail, with the secondary plans they encompass often including maps that show the proposed layout of the street network for that area. Whether there is attention to connectivity or not varies. Plans from Brampton (Figure 2) and Cape Town (Figure 3) feature grids as the spatial basis for development. The *Cape Flats District Plan* provides greater detail about how implementing a gridded network promotes accessibility; this can be found in Appendix D.

Although the Mount Pleasant area is cited as an exemplar of sustainable neighborhood development (City of Brampton and The Planning Partnership, 2013), it can be observed

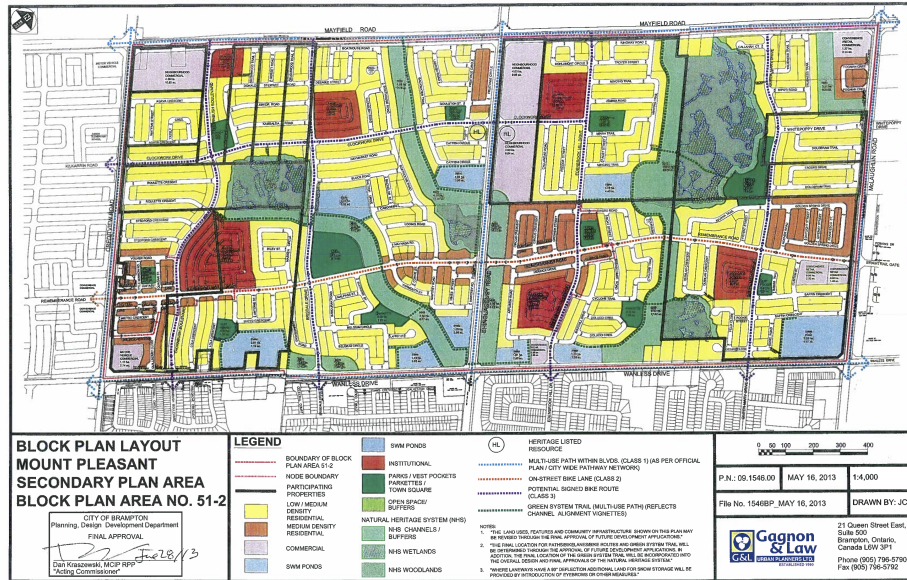


Figure 2: Block Plan for Mount Pleasant Secondary Area, Brampton. (City of Brampton, 2017)

that quite a few of the local roads are cul-de-sacs; such a layout can hamper connectivity in a neighborhood.

In the Philippines, where there is scarce mention of grids in plans, external actors have stepped into the planning process to create grid-based connected communities. The UN's *Achieving Sustainable Urban Development Project (ASUD)* advised on several planned city extensions in the Philippines, and their objective is to build “compact, inclusive, connected and resilient cities”. While the grid-iron pattern is not explicitly mentioned, it is definitely implied as a spatial foundation for realizing that objective, as seen in Appendix section §E. Similarly, the local plans in Ghana (at least, for the Adansi North, Adentan and Nkoranza North districts) are lacking in policies addressing connectivity, despite the emphasis of it at the national level. However, this may change as local plans become updated to comply with the new national plan. In addition to the spatial frameworks, Ghana’s national government has also issued the *Zoning Guidelines and Planning Standards*, which are intended to guide developers as well as local government in deciding what sorts of construction to permit (Government of Ghana et al., 2011). These standards are meant to be statutorily enforceable, and include details such as street intersection separation distances, which has important consequences for the connectivity of the street network. These rules can be found in Appendix section §F. It would be a safe assumption that other countries have similar standards too, and they are likely to be found in by-laws or city codes.

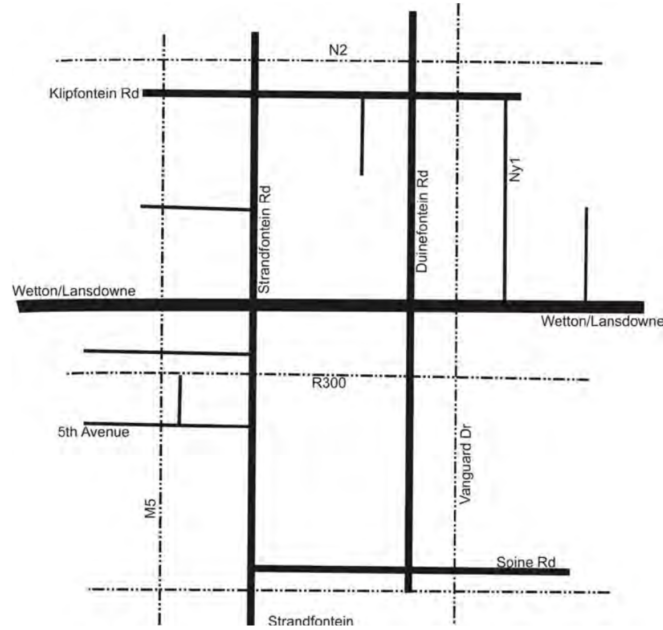


Figure 3.4: Conceptual accessibility grid for the Cape Flats District

Figure 3: **Planned grid for the Cape Flats District, Cape Town.** (City of Cape Town, 2012)

4 Future research directions

4.1 Enforceability

As several of the plans acknowledge, there is often a gap between what policy sets out to achieve and the actual implementation. In countries with weaker planning institutions and a more severe state of urban sprawl (such as Ghana and the Philippines), illegal construction is a challenge for urban planners. In the Philippines, private developers dominate decision-making of urban development. In spite of national directives, implementation and enforcement at the local level has been weak, rendering local governments “nothing more than passive spectators to the developments occurring in their territories” (Government of the Philippines, 2016). With decentralization policies aiming to strengthen the authority of these local governments only being enacted not too long ago, it remains to be seen how effective local government can be in regulating private developers.

It would be interesting to further explore the interaction between governments and private developers during the planning process. The adoption of these plans often invite contributions from residents and other stakeholders; private developers would be able to give input to the formulation of these plans. Observing the application process developers have to go through before they are able to build on a plot of land would also reveal the conflicting interests of planners and developers. It could be more difficult to examine such interactions in planning systems where local authorities can be easily bypassed.

4.2 Evidence-based policymaking

Reluctance to support highly connected communities stems from fears of purported negative externalities, such as higher crime rates. Handy noted that “empirical evidence on street connectivity and property crime rates is currently lacking”. At the same time, the positive effects of high connectivity are not fully known -- evidence on the impact of street connectivity on different modal shares of transportation remains ambiguous and inconclusive (Handy et al., 2003). Hence, more research can be done to assuage any doubts, so as to bolster political will and public support for better connectivity.

4.3 A computational approach?

With each level of government making plans for their jurisdictions, there are a vast number of plans in existence that could provide insight into planning priorities and efforts across different regions. The decentralization of planning systems also implies that variation in planning across regions is to be expected, as each region would have its own economic, geographic and social challenges to address. For this survey, the district plans selected may not necessarily be representative of planning principles in the country. It is thus difficult to derive a comprehensive evaluation of connectivity policy globally.

Using a text-as-data approach is increasingly popular in social science research (Gentzkow et al., 2017), and could help in analyzing the abundance of planning policy documents. Topic modeling can be a way of capturing the major themes in a corpus of documents and observing how these themes evolve over time (Isoaho et al., 2019). Such an approach could allow us to model policy attention towards street connectivity, and the change in the policy attention over time (if any) could be cross-referred to the evolution of street networks.

5 Conclusion

Street connectivity is an important consideration in the planning of urban expansion. The attention paid to it is inconsistent across the different countries I surveyed, and also varies at different levels within the countries too. National-level attention has increased, no doubt influenced by global attention to urban planning challenges. The thorough nature of the adoption process of a plan ensures that all interests can be represented and problems can be comprehensively addressed; however, this process also makes plans less dynamic. It remains to be seen in Ghana and the Philippines if the top-down propagation of prioritizing street connectivity will be effective.

In recent years, there has been a trend towards the adoption of a national policy to set direction and facilitate the coordination of local agents, who take on the bulk of responsibility for land-use planning. There appears to be general understanding at all levels of government of the importance of street network connectivity, but a gap exists in actionable policy of how to achieve this. Answering the outstanding questions highlighted in Section 4 may provide greater insight into planning decisions, and allow us to make effective and targeted policy recommendations to devise a more sustainable pattern of urban expansion.

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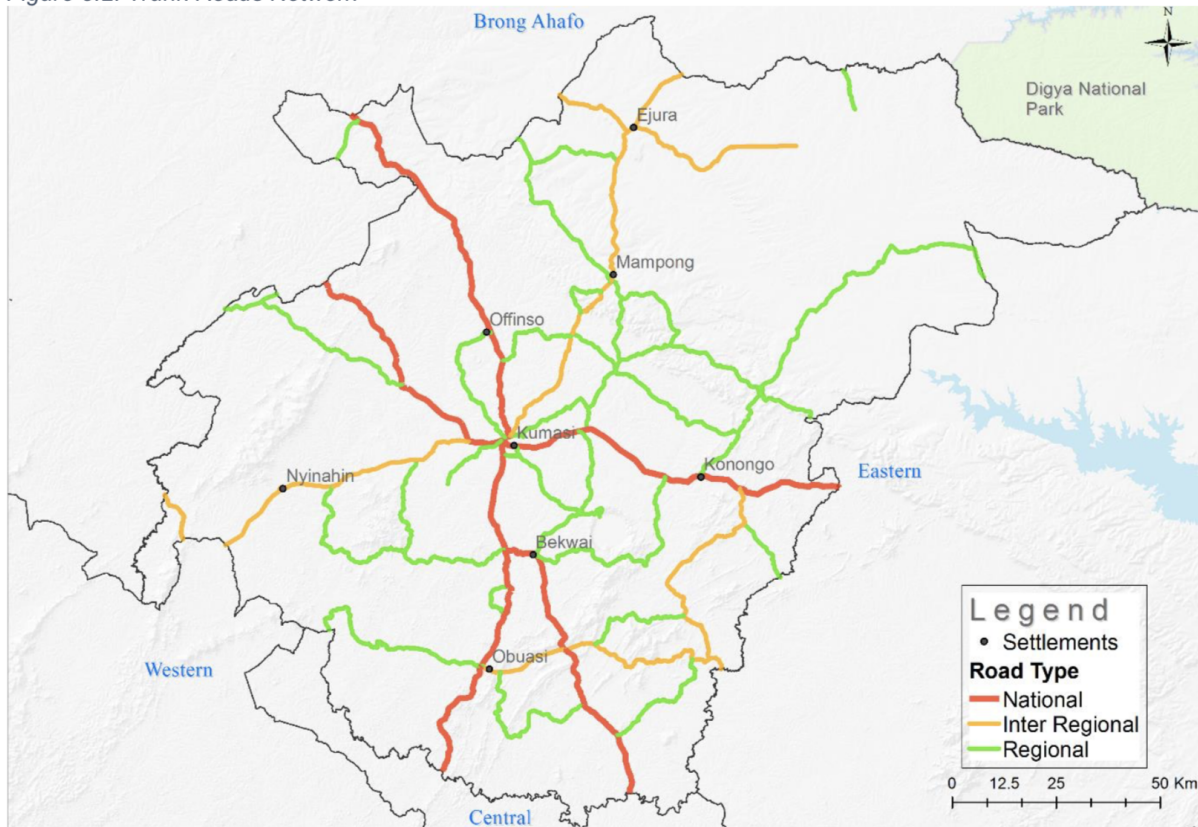
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A Trunk Road Network (Ashanti Region, Ghana)

Figure 5.2: Trunk Roads Network



Source: Ghana Highways Authority, 2015

Figure 4: Existing trunk road network in the Ashanti region (Government of Ghana and Ministry of Lands and Natural Resources, 2017a).

Figure 2.3: Proposed Transportation

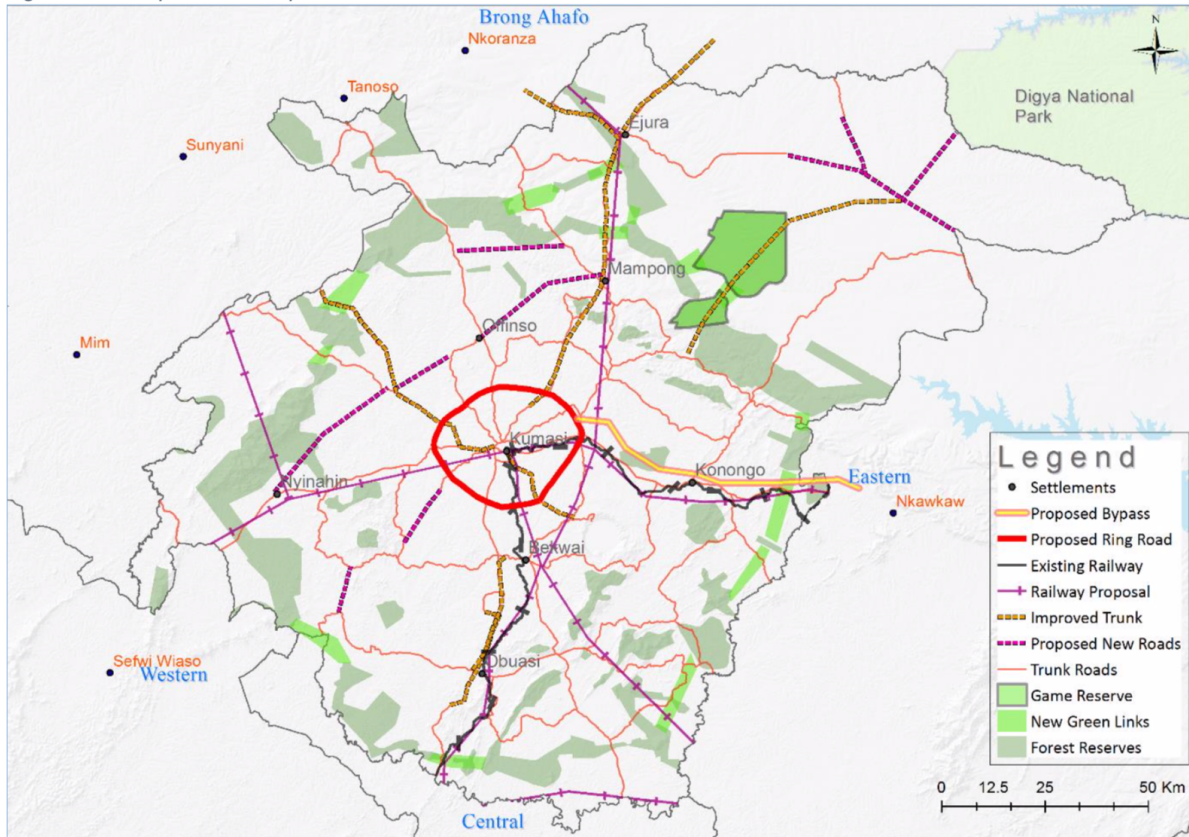
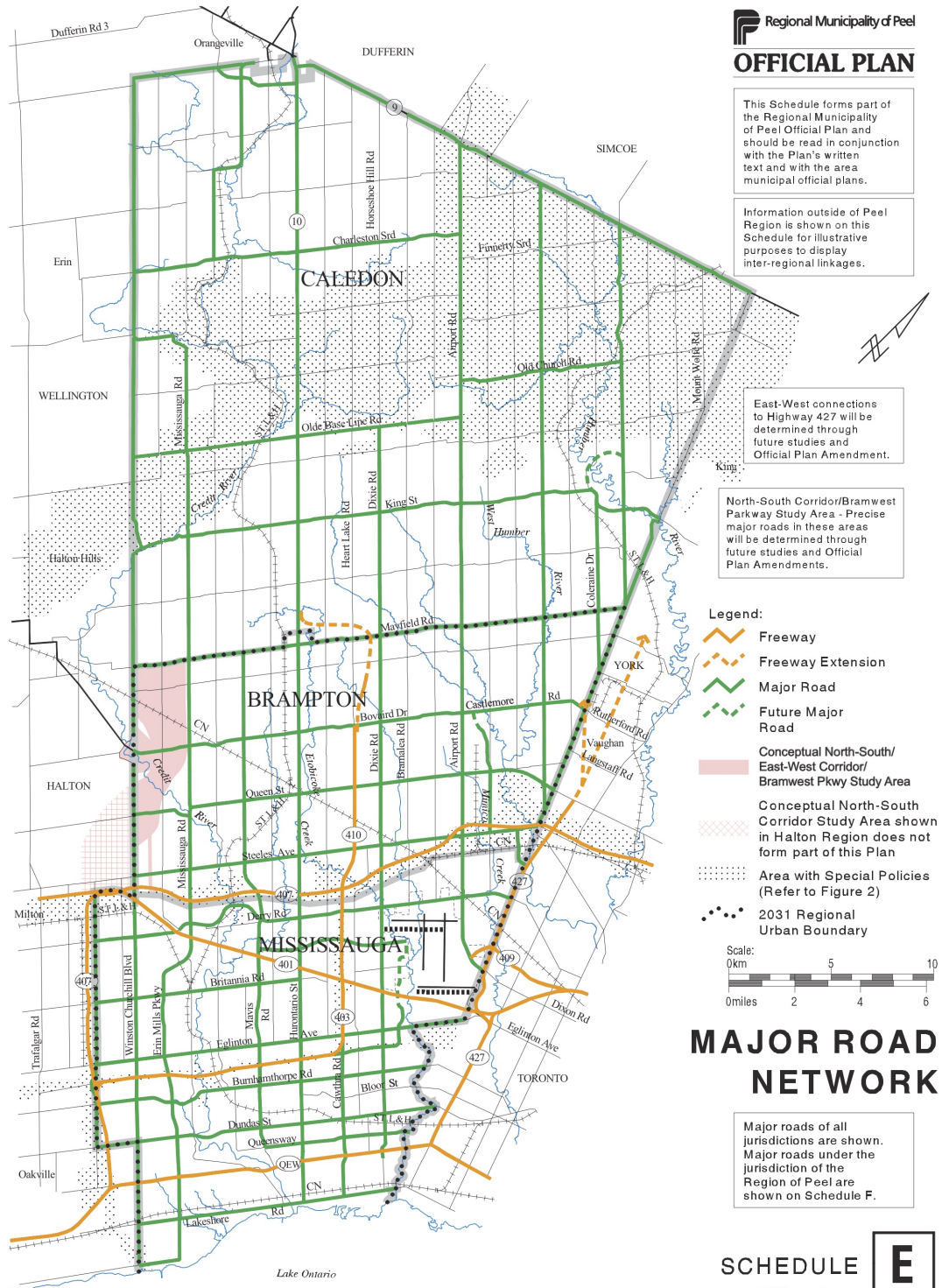


Figure 5: **Proposed improvements to the trunk road network** (Government of Ghana and Ministry of Lands and Natural Resources, 2017b).

B Major Road Network (Peel Region, Canada)

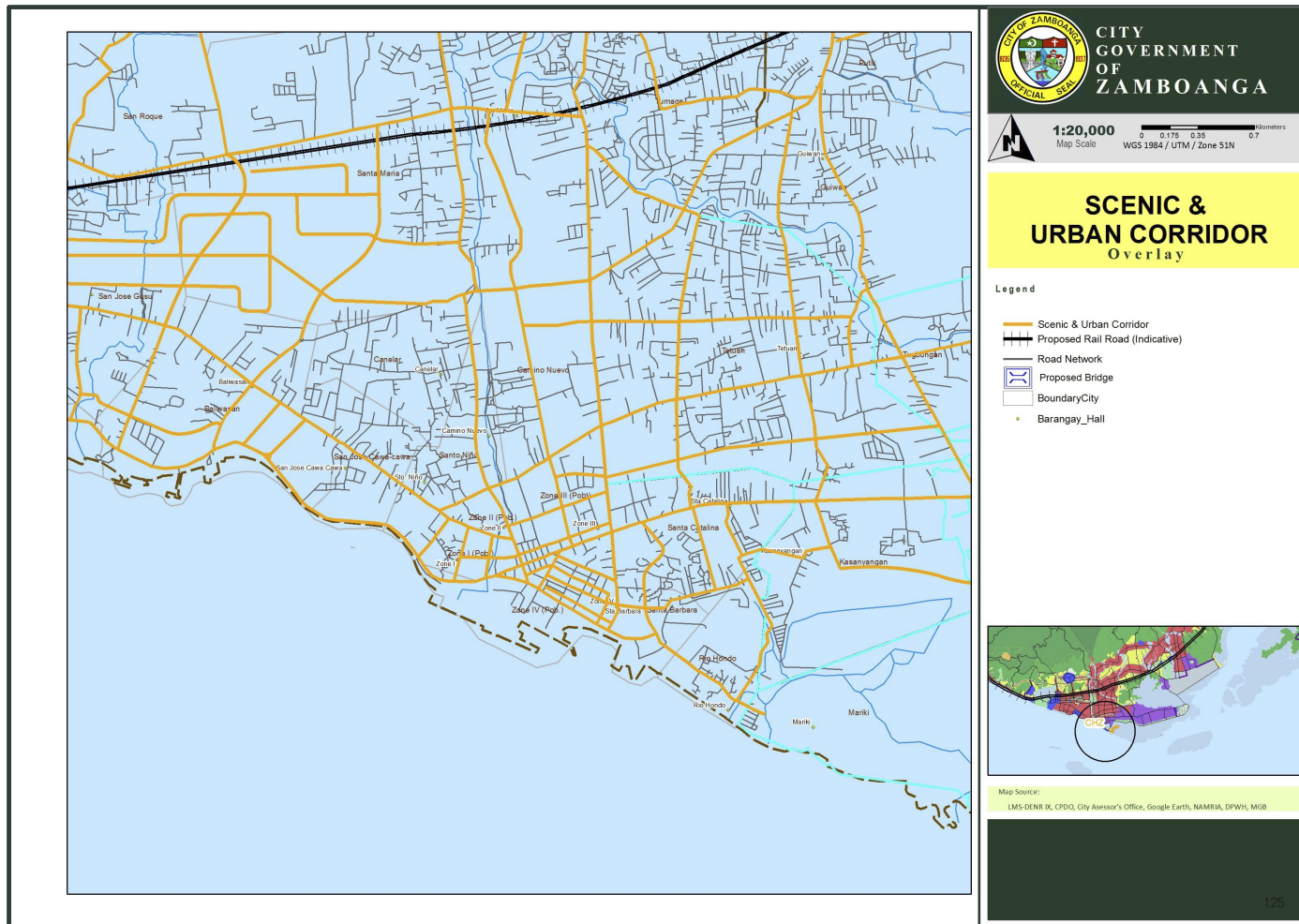


See section 120 for description on amendments.

(Region of Peel, 2018)

C Urban Corridor Network (Zamboanga City, Philippines)

25



(City Government of Zamboanga, 2016)

D Spatial Principles (Cape Flats District, Cape Town, South Africa)

3.1.3 Spatial concepts and structuring elements

Spatially, there is a need to ensure that the movement system provides convenient access to jobs and other opportunities. Furthermore, there is a need to further concentrate employment in areas that are convenient and easy for people to access. In this regard, several spatial structuring elements and concepts are significant in thinking about the spatial organisation of the City and district:

a) The multi-directional accessibility grid

The aim is to set up a grid of accessibility that facilitates convenient access and multidirectional movement between the district and other parts of the city ("primary accessibility grid") and within the district ("secondary accessibility grid") which will feed the primary grid.

This grid will comprise a hierarchy of routes which provide varied, but complimentary roles in terms of accommodating a continuum of mobility and accessibility functions.

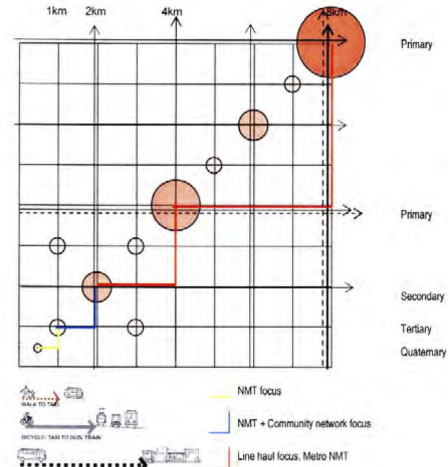


Figure 3.1: Accessibility Grid

The **primary accessibility grid** incorporates:

- **Activity Routes:** Activity routes are characterised by strip and/or nodal urban development along sections of the route. Activity routes are generally supported by a mix of land uses and higher density urban development. Activity routes are characterised by direct access and interrupted movement flows, especially at bus and taxi stops and traffic lights.



Figure 3.2: Activity Route

- **Development Routes:** Development routes have a greater mobility function than activity routes. Mixed land use and higher-density development tend to be nodal, with access provided at intersections and generally linked to parallel and connecting side routes. Development routes may include short stretches of activity route-type development.



Figure 3.3: Development Route

The primary accessibility grid is supported by a system of mobility links, which play a key role in reinforcing urban structure and include:

- **Urban freeways:** Urban freeways fulfil a mobility function, and do not permit direct accessibility to abutting land uses. The high connectivity provided by direct freeway/expressway connections tends to attract manufacturing, warehousing, major retail and industrial land uses. These opportunities tend to be realised around key intersections / off ramps and roads running parallel or linked to urban freeways.
- **The rail network:** the rail network provides for mobility over longer trip distances. The stations supporting the rail service are primary points of accessibility, particularly when associated with areas of high road based accessibility and can generally support intense concentrations of activity and medium to high land use densities.

The **secondary accessibility grid** incorporates:

- **Activity Streets:** Activity streets are characterised by strip and/or nodal urban development along sections of the route, although generally of lower intensity than typically found on activity routes. Activity streets are generally supported by a mix of land uses and medium-higher density residential development. Activity streets are characterised by direct access and interrupted movement flows, especially at bus and taxi stops and traffic lights.
- **Other Structuring Routes:** routes which provide structure (ordering land use configuration and intensities) to local areas and may accommodate a mixed activity / mobility function, but do their role in accommodating activity is less intense than activity routes/streets.

The secondary accessibility grid is supported by a system of lower order mobility links which may include:

- **Connector route:** Connector routes connect different areas of the city and are typically characterised by high volumes of fast-moving traffic. In some instances, direct access to abutting land uses and residential properties is provided along connector routes.

The hierarchical, multi-directional accessibility grid envisaged for Cape Town lays the foundation for the routing and service design of an Integrated Public Transport Network (IPTN) intended to place over 85% of the city's population within 1 km of a high-quality public transport system. The IPTN will inform a hierarchy of public transport services relating to the accessibility grid, including:

- A **rail service** that provides a high-performance, high-volume and safe public transport service, which will be the preferred mode of choice of long-distance commuters. Conceptually, this service should be provided at 8-16km intervals on a city-wide to district level - forming part of the *Primary* tier of the accessibility grid.
- A **road based trunk service**, provided by articulated and standard buses on dedicated and semi-dedicated right-of-way infrastructure that offers an 18-hour frequent and rapid service along major metropolitan and district level roads, and along development and activity routes – forming part of the *Primary* tier of the accessibility grid.

- A **community (feeder and distribution) service**, at 4-8km intervals, provided by standard buses and smaller vehicles, that feeds into the trunk bus and rail services. The community service will operate at a district to inter-suburb scale, along district-level activity routes and streets – forming the *Secondary* tier of the accessibility grid.
- **Pedestrian and cycle lanes** should be provided along public transport routes and around public transport stops, stations and interchanges to facilitate safe and convenient access to public transport services – forming the *Tertiary and Quaternary* tier of the accessibility grid.

Note: The route designation reflected above does not replace the City's Hierarchical Road Network Classification system, nor is it intended to run in parallel as a duplicate classification system. Annexure E describes the relationship between the CTSD / district plan route designations and DoT, the PSDF and the City's hierarchical road classification network.

STRATEGY 1 - THE CENTRAL SPATIAL IDEAS

a) Cape Flats District: The multi-directional accessibility grid

The integration of rail and road movement network and easy accessibility to interchanges or points of access where the secondary accessibility grid (community/feeder public transport network) meets the primary grid (18hr public transport network) are central to the functioning of the district. The specific function of each of these routes should be reinforced to support the larger system, with a particular priority on good public transport, with rail as the backbone, and also including local non-motorised transport.

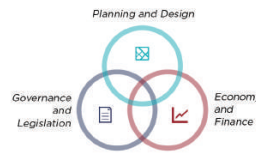
- In this context, the central spatial ideas in relation to the **accessibility grid** highlighted in the district spatial concept include: **The Wetton/Lansdowne Road Corridor:** The movement and access roles of the Wetton Lansdowne Road corridor are central to the functioning of the district. The corridor reflects the primary means of east west movement within and across the district, supporting and providing access to employment and social opportunities. It's role should be reinforced and emphasis placed on strengthening it's public transport function, intensifying land uses along it and improving the quality of the public environment (road-based public transport and NMT improvements, public space upgrading)
- **The Network of Development Routes:** a network of development routes is a system of arteries in the district and supports the primary east west corridor, further supporting and providing access to employment and social opportunities. It's role should be reinforced and emphasis placed on strengthening it's public transport function, intensifying land uses at key intersections and improving the quality of the public environment (road-based public transport and NMT improvements, public space upgrading). This system is further supported by a number of activity streets, offering access to local level economic and social opportunities.
- **Developing the East West Mobility Link:** Improving east west mobility linkage, particularly between the district and areas to the east and west is critical. This is achieved by the completion of the R300 extension. This includes access to the Southern District in particular. This will facilitate access to the economic and social opportunities offered by that district. In addition to the above, reinforcing the development of a **"secondary accessibility grid"** feeding local movement generators and the primary grid including:
 - A system of local activity streets within the area.
 - A range of other structuring routes which contribute to the completing the secondary accessibility grid;
 - A system of interchanges or points of access where the secondary accessibility grid (community /feeder public transport network) meets with the primary grid (line haul, 18hr public transport network).

E ASUD Principles (United Nations)

Project Summary Approach & Principles

As the Philippines experiences consistently high economic growth, cities and urbanizing areas are now experiencing spontaneous unplanned urbanization resulting in sprawling, exclusive, segregated, and vulnerable communities and spaces. But an achievable alternative is possible: compact, inclusive, connected and resilient cities. ASUD helps local government units in addressing rapid urban growth and the challenges of urbanization through planned city extensions (PCEs).

THE THREE-PRONGED APPROACH



Planned City Extensions Snapshots

The three-pronged approach and the principles on urban space were translated into plans and designs. Legal and financial tools were recommended to facilitate implementation. Insights in doing the pilot work informed the review and enhancement of national urban policies under the guidance of the project steering committee composed of national government agencies, local government units and development partners.



LEGEND

- River
- Road network
- Agricultural
- Public space
- Residential
- Commercial
- Mixed use
- Institutional

UNSUSTAINABLE URBAN DEVELOPMENT



SPRAWLING CREATES LARGE AND LOW DENSITY BLOCKS THAT MAKE TRIPS LONGER.



EXCLUSIVE SEPARATES PLACES, PEOPLES, AND ACTIVITIES FROM EACH OTHER.



SEGREGATED DISJOINTED ROAD NETWORK WITH NO CLEAR HIERARCHY.



VULNERABLE MARGINALIZES, CONSTRICTS, & FRAGMENTS WATER, FARMLAND.



COMPACT BUILDS SMALLER, WALKABLE, AND DENSIFIED BLOCKS.

INCLUSIVE ENCOURAGES SOCIAL MIX THROUGH DIVERSE PEOPLES AND USES WITHIN THE DISTRICT, BLOCK, AND BUILDING.

CONNECTED INTERCONNECTS ROADS AND STREETS WITH A CLEAR HIERARCHY.

RESILIENT BUILDS WITH NATURE, MAKES ROOM FOR WATER THROUGH PUBLIC SPACES, AND CONSERVES FARMLAND.

ALL GEOSPATIAL DATA IN THIS BROCHURE IS FROM www.openstreetmap.org and OpenStreetMap. INFOGRAPHICS AND MAPS DRAWN BY David Jonathan C. Garcia



F Planning Standards for Roads (Ghana)

2.8 Planning Standards for Roads

2.8.1 Road Reservation Requirements

A summary of road reservation standards are provided in Table 4.

All standards are mandatory except the percentage point incline which is advisory.

Table 4. Summary of road reservation standards

Road Classification		Right of Way (m)	Carriage Way (m)	Median (m)	Shoulder (m)	Layby (m)	Walkway /Bicycle (m)	Tarred width (m)	Max incline (%)	Remarks
Highways	Motorway/ Expressway	90	7.3 X 2	5 – 10	3.0 X 2	-	-	7.3 X 2	6	Ditch, buffer and utility considered
	National roads	60	3.65 X 2	-	2.5 X 2	3.5 X 2	-	7.5	8	End of fill, buffer and utility considered
	Inter-regional /regional roads	55	3.5 X 2	-	2.5 X 2	3.5 X 2	-	7.0	8	End of fill, buffer and utility considered
Urban Roads	Major arterial	90	11.0 X 2 (3 lane)	2.0 X 2	-	3.5 X 2	6.0 X 2	11.0 x 2	6	Drain, Service lane, Separator, buffer and utility considered
	Minor arterial	40-60	7.3 X 2	2.0 X 2	-	-	5.0 X 2	7.3 x 2	8	Drain and Service lane, buffer and utility considered
	Collectors	20-45	3.65 X 2	-	-	3.5 X 2	5.0 X 2	3.65 x 2	8	Drain, buffer and utility considered
	Local road	18-30	3.65 X 2	-	-	3.5 X 2	-	-	10	Drain, buffer and utility considered
	Cul-de-sac	12	3.0 X 2	-	-	-	-	-	12.5	
	T-head for cul-sac	24								
	Foot paths	6.00								
Feeder Roads	District/ Sub-district	30	3.0 X 2	-	-	-	-	-	10	Drain, buffer and utility considered
	Community road	15	2.5 X 2	-	-	-	-	-	12.5	Drain and utility considered

Length of any cul-de-sac should not exceed 200m



2.8.2 Ancillary Requirements

2.8.2.1 Corner Truncations and Setbacks

Corner truncations are required for all plots at road intersections to ensure adequate sight distance. The distance for the commencement of the truncation from the intersection of two roads shall apply as follows:

- | | | |
|----|---------------------------------|--------|
| 4. | a) Local access and cul-de-sacs | 3.5m |
| 5. | b) Collector Roads | 5.00m |
| 6. | c) Major Arterial | 10.00m |

2.8.2.2 Street Intersection Separation Distances

Street and road intersections located in close proximity to each other should be designed with the following centre line to centre line separations.

- | | |
|---------------------------------|-----------------------|
| a) Minor Roads and Streets | 50m |
| b) Collectors | 100m |
| c) Arterials (single carriage) | 500m |
| d) Arterials (dual carriageway) | 4km between junctions |

2.8.2.3 Right of Way (RoW) for Public Drains

Where an overland drainage flows through an area to be subdivided, a R.O.W shall be provided and shall remain free to any building or structure which may restrict flood flows. In the Central Business District and major Commercial Centers all drains should be covered and designed to meet flow capacity as determined above. A primary drain is one that exceeds 30 cum/sec, a secondary drain is one that exceeds 10m cum/sec and a tertiary drain is one that has flows less than 10cum/sec, based on a five year return cycle.

The R.O.W. to accommodate expected flood shall be calculated as follows:-

- | | |
|--------------------|-----------------------|
| a) Primary drain | 1:50 year flood level |
| b) Secondary drain | 1:30 year flood level |
| c) Tertiary drain | 1:10 year flood level |

2.8.2.4 Access Way to Private Land and Private Road

The minimum width of any access way serving a single plot of land not fronting a road shall be 2.5m. Where an access way serves more than one plot, not fronting a public road, this shall be increased by 1.5m per plot up to a maximum of 6m. Not more than six plots shall be serviced from an access way. The minimum width of any private road shall be 12m. Not more than fifteen houses shall be serviced by a private road.

2.8.2.5 Easements/Wayleaves for Public Utilities

Where any land fronts a public drain, or has infrastructure or other public utility services passing under or above the land, and easement/wayleave should be created upon the land restricting the erection of any structure which might prevent the maintenance authority from carrying out routine maintenance or other repairs. The minimum width of any easement shall be 3.0m on either side of the service line.

2.9 Planning Standards for Parking

Parking facilities should be provided by a developer within the boundaries of a site, at an agreed nearby location for all public, commercial, industrial and residential development in accordance with the following schedule. Where provisions in this documents conflict with the Transport Impact Assessment (TIA) Guidelines, provisions of the TIA guidelines shall apply.