

# **From Conceptual Frameworks to Quantitative Models: Spatial planning in the Durban metropolitan area, South Africa—the link to housing and infrastructure planning**

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# From Conceptual Frameworks to Quantitative Models: Spatial planning in the Durban metropolitan area, South Africa—the link to housing and infrastructure planning

Ken Breetzke<sup>1</sup>

## 1. Introduction

This case study discusses the links between spatial planning and the planning for public housing and infrastructure provision in Durban<sup>2</sup>—these being key components influencing and driving the development of the city. It looks at how the approach to spatial planning has changed, the limits of the type of broad spatial planning that was undertaken following the critique of master planning, but also the constraints on its effectiveness that lead to disjunctures between plans and outcomes. A number of initiatives that attempt to improve the linkages between infrastructure planning and public housing provision and spatial planning are discussed.

Section 2 paints a picture for those who don't know Durban, of its socio-economic make-up and spatial structure and the key policies that influence planning and development. The recent history of local government and spatial planning over the last 20 years is covered briefly in view of its critical influence. Section 3 deals in some depth with the spatial development framework and its weaknesses which led to the introduction of spatial development plans discussed in Section 4. Section 5 reflects on the implications for infrastructure provision and Section 6 considers recent processes to link spatial, housing and infrastructure planning in an effort to deal with some of the historical shortcomings.

## 2. Background

Durban is a coastal metropolitan area on the east coast of South Africa, within the province of KwaZulu-Natal with a population of 3.5 million people (in 2006). See Table 1 for details on housing typology. It is one of four metropolitan areas in South Africa and is one of the strongest municipalities in the country from the point of view of human and financial resources. The metropolitan area is characterized by high levels of poverty and unemployment (35.5 per cent in 2006) and historical marginalization of the poor. Due to the country's legacy of apartheid or separate development of the various race groups, the socio-economic divides described are highly racialised. This manifests spatially in massive formal and informal low-income

**Table 1. eThekweni housing typologies**

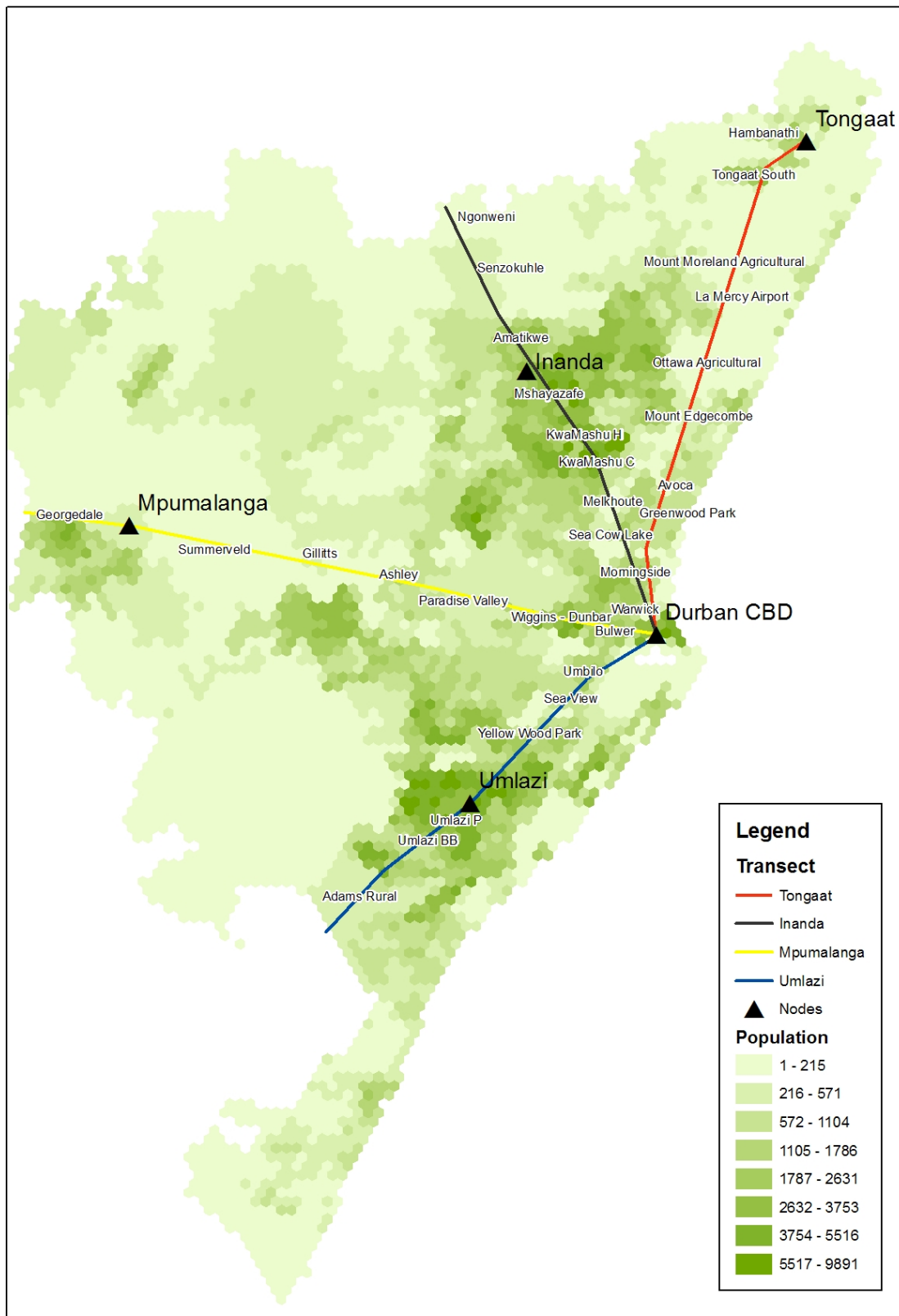
Housing type	No. of households	Percentage
Formal	602,880	72.3
Informal	142,590	17.1
Traditional	53,367	6.4

*Source: Statistics South Africa, Community Survey 2007, quoted in O'Leary, 2008.*

1. The author would like to thank Professor Alison Todes for her guidance and insight in the compilation of this case study. To all his colleagues within the municipality who have 'journeyed' with him on projects over the years, thank you. Special acknowledgement must be made of the fantastic efforts of Cheri Green and her team at the Centre for Scientific and Industrial Research, as well as Brendan Magill without whose technical brilliance a number of projects would not have achieved success.

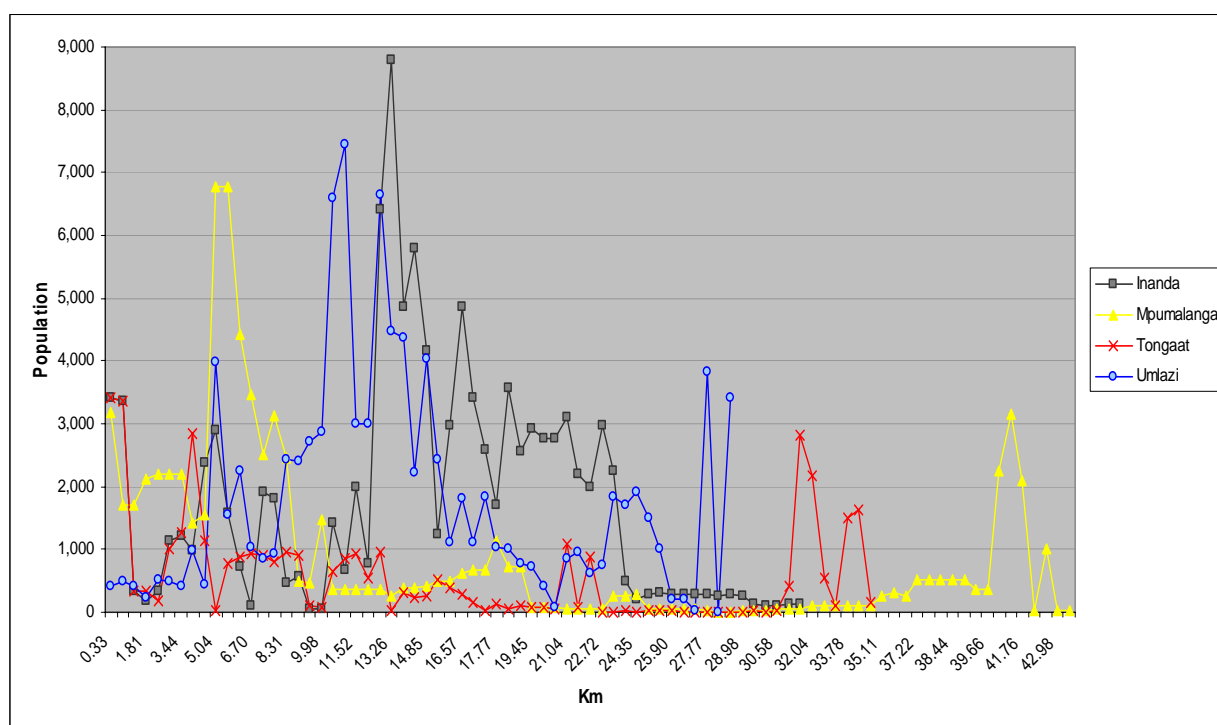
2. Durban is the city within the metropolitan area called eThekweni. In common parlance the city of Durban and its urban extent is usually referred to as Durban. However since the proclamation of the metropolitan boundary in 2000, the entire metropolitan area (including its urban as well as its substantial rural hinterland) became known as eThekweni. When specific reference is being made to the entire area then the term eThekweni is used. During the boundary demarcation process the eThekweni metropolitan area was, for a short period, referred to as the Unicity—this is seen on some of the older maps.

**Figure 1. eThekweni densities and transect descriptions**



Source: Green and Mans, 2008.

**Figure 2. eThekweni density transects**



Source: Green and Mans, 2008.

housing settlement on the periphery of the core metropolitan area. This housing is home to mostly black South Africans and is located more than 20 km from the Durban central business district (CBD), the port of Durban and its surrounding industrial development—which together provide an estimated 60 per cent of employment in the region. Historically, city growth originated around the port, and infrastructure networks grew outwards over the years with a bias towards the two national roads—the N2 running north/south parallel to the coast and the N3 linking Durban to the South African economic heartland around Johannesburg. Residential development has in general been at low densities (see Figures 1 and 2). Higher income suburbs with low densities of 2–10 dwellings/hectare have developed along the alignment of these two national roads—these being the areas with the best accessibility (and thus convenience). Formal low income suburbs situated away from these national routes display relatively higher densities at 40–50 dwellings/hectare.

Figure 2 shows that for all transects, the areas within 10 km of the Durban CBD have relatively low densities—representing primarily the wealthier and mainly white South African suburbs. From 10–18 km there is a density spike which picks up the lower income and primarily black South African suburbs or townships and informal settlement areas. A number of these townships occur further out (at the 28 km and 43 km marks).

The provision of formal serviced housing for the poor is facilitated by subsidies from the national housing programme. The policy is to formalize and service the bulk of informal settlements ‘in-situ’ in order to retain the social networks which support people’s livelihoods. Formalisation commonly leads to relocation of 30 per cent of households which are then accommodated in new greenfield projects which similarly have a peripheral location due to land being cheaper in more outlying areas. The municipality builds approximately 12,000 houses per year and has been doing this for more than 10 years. The backlog currently stands

at approximately 210,000 households or 850,000 people. Informal settlements with limited servicing are transformed into 30 m<sup>2</sup> brick and mortar houses serviced with electricity, water on tap and flush toilets. There is substantial political pressure to increase housing delivery irrespective of location. The provision of new houses, basic infrastructural services and social facilities<sup>3</sup> represent the re-election ‘ticket’ for most political representatives.

Few formal job opportunities exist within these dormitory suburbs and accessing employment means long daily commuting to larger centres. Commuting distances range from 12–25 km to more than 40 km. Travel is by subsidized rail or bus and private mini-buses. Return travel times are excessive, ranging from two to four hours. High transport subsidies are viewed by government as a structural weakness that must be dealt with.

Spatial planning has a legacy within the structure of local government prior to the formation of a single unitary metropolitan local authority (eThekweni) in 2000. Figures 3 and 4 show the metropolitan area comprising numerous local authorities,<sup>4</sup> each responsible for planning and delivery. Plans were prescriptive or deterministic with high levels of detail but with only partial geographic coverage which favoured suburbs reserved for white South Africans. A round of consolidation produced a metropolitan area comprising six local councils<sup>5</sup> (see Figure 4) but rather than foster integration it heightened competition between areas. The six councils became responsible for funding service delivery to vast areas that previously had little investment or planning. These financial demands fostered parochial interests of attracting development to their own areas even if this ‘robbed’ businesses from neighbouring councils. Although a metropolitan Spatial Development Framework (SDF) was formally adopted from 1997, this remained a policy document and the local councils followed their own plans. Even post 2000, with the formal consolidation of all the local councils into a single, much larger metropolitan area (labelled “New Uricity boundary” in Figure 4—eThekweni—these ‘divides’ between councils were still very much prevalent.

During this period of change in local government, the Tongaat Hulett Group<sup>6</sup>—which had vast land holdings—championed sub regional planning exercises of its own to garner support particularly for growth in the northern portion of the municipality. This found support within provincial planning circles and with politicians and officials in the North Local Council (NLC, see Figure 4) who were focusing on economic expansion.

Infrastructure engineers derived less value from spatial plans from the 1990s onwards. Prior to this, very detailed plans allowed for straight forward calculation of infrastructure capacities from land-use zonings.<sup>7</sup> The massive urbanization of the black South African population in the late 1980s and 1990s and the need to service these peripheral settlements necessitated new rounds of infrastructure planning. At the same time planning was in a crisis—the profession was maligned for having played an active role in apartheid spatial planning and the ‘blue print’ mode of planning was also being challenged. The emphasis within the planning profession shifted from detailed structure plans and town planning schemes to conceptual spatial frameworks without the level of land-use detail required to plan infrastructure systems.

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3. Including community halls, clinics, libraries, swimming pools, parks, sports fields, fire stations, etc.

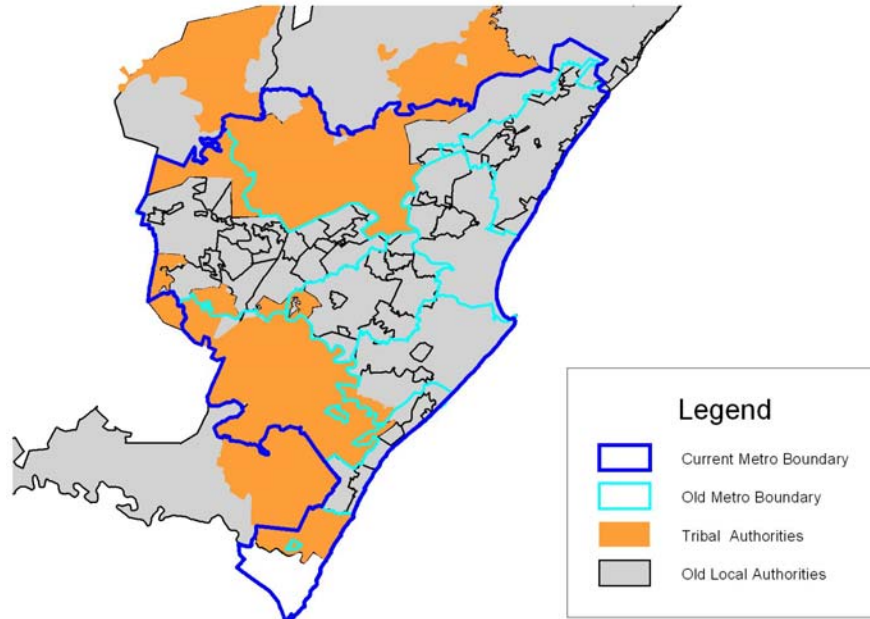
4. Referred to as ‘old local authorities’ on Figure 3.

5. The local councils were labelled according to their geographic location viz. NLC (North Local Council), SLC (South Local Council), IW (Inner West Local Council), OW (Outer West Local Council), NCLC (North Central Local Council), SCLC (South Central Local Council).

6. A private company farming sugar cane that had seen the opportunity to profit from converting land under cane to offices, shops and high income residences.

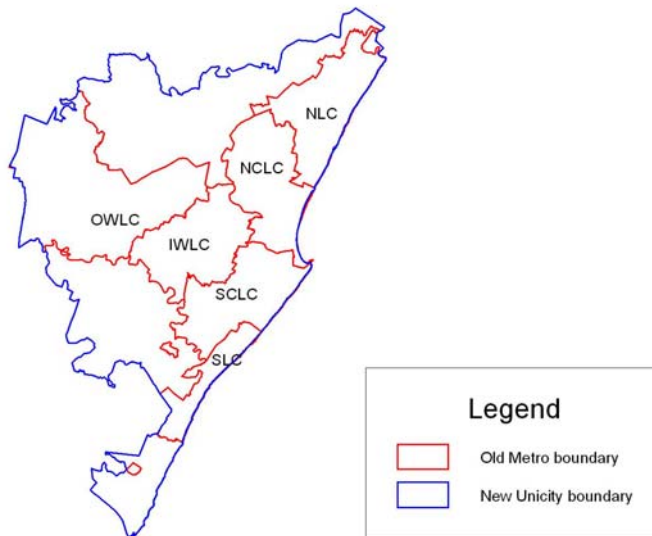
7. Though there is ample evidence that predicted land use intensity was often never realised and hence big infrastructure spare capacities exist decades after effective ‘full development’ has taken place.

**Figure 3. Local Authority boundary changes**



Source: O'Leary, 2008.

**Figure 4. Local Council boundaries**



Source: O'Leary, 2008.

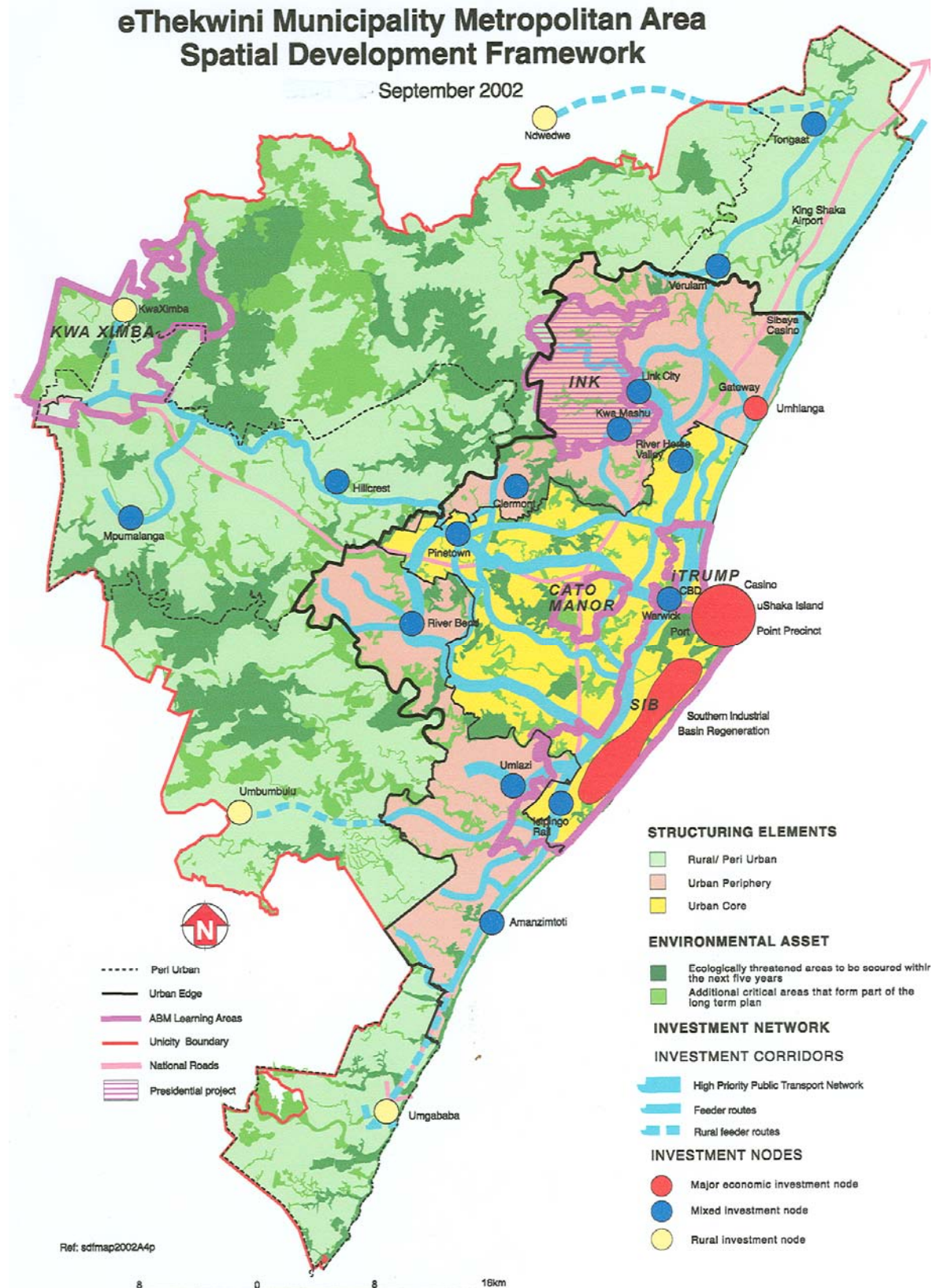
### **3. The Metropolitan SDF: the Approach and its Main Weaknesses**

The 2002 metropolitan SDF contained the following intentions and structuring elements (see Figure 5):

- The intention to spatially restructure the apartheid city and remedy structural problems.
- The vision of a compact city with high accessibility and convenience in a dense urban area that overcomes the inefficiencies of low density sprawl.



Figure 5.



Source: Corporate Policy Unit, 2002.



- It aimed to refocus private investment<sup>8</sup> in the developmental corridor (R102 north and south).<sup>9</sup> Nodes and corridors are places where public and private investment is intensified. Nodes within poorer areas will have higher order social facilities, public transport modal interchanges and increasing economic activity. Investment corridors connect the ‘rich’ and ‘poor’ nodes. Over time intense development will link nodes and improve social integration.
- The Durban CBD and Southern Industrial Basin (SIB) are the major nodes with smaller satellite centres in support.
- It promoted development intensification inside the urban edge and particularly along the north-south rail corridor (Link City in the north to Umlazi in the south) to support increased public transport usage and viability and reduce transport subsidies.
- It promoted economic activity in the poor areas in order to both reduce travel and increase local spending.
- Utilisation of sewer treatment excess capacities in the core urban area through increased development. In 2005, 47 mega litres of spare sewage treatment capacity existed in the core urban area—this spare capacity can serve 235,000 low-income houses.
- Introduced an urban edge as an urban containment measure to curb urban sprawl, promote development compaction, secure valuable agricultural land and upper catchment environmental assets. The urban edge was based on a ‘water borne edge’- the area that could be served with current water borne sanitation systems. This edge line was largely a policy response to development trends in the late 1990s. The then local council to the north (NLC) in partnership with the property development arm of the Tongaat Hullett Group, brought attractive office and retail space onto the market which lured business out of the Durban CBD which was suffering from crime and grime. The intention of the urban edge line was to attempt to limit the continued growth of the Umhlanga ‘local’ node which was competing with the Durban ‘regional’ node which was contrary to the planning intent embodied within the SDF.

The period since the adoption of the first metropolitan SDF (1997), including its review in 2002 and the post-2002 period highlighted the following weaknesses in the SDF:

- It could not provide substantial guidance to private development because it is conceptual and bears no relationship to the legal mechanisms that control land use—the town planning schemes that were a product of the era of ‘blueprint planning’ and have not been reviewed in line with new visions of development. Further to this, the SDF, despite the efforts of municipal officials driving the process, remained largely an in-house planning exercise without the buy-in of national and provincial government or key land owners/developers or any serious commitment of eThekweni’s ruling political party.
- Land owners with vacant land beyond the urban edge<sup>10</sup> were successful in developing. In some instances this development was facilitated by the required zonings already

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8. Historically private development has preferred locations with high visibility and accessibility alongside the national roads.

9. On Figure 5, find this route through the centres of Umlazi, Warwick, Link City, Verulam and Tongaat.

10. That is, within the urban periphery on the SDF. Notable examples were around Hillcrest in the west with 4000–5000 high income residential units, and north of Umhlanga numerous coastal residential developments as well as Durban’s new airport/logistics hub (Dube Trade Port-labeled as King Shaka Airport on SDF) a project

being present in the pre-SDF plans. When new zonings had to be approved, developers used their legal and political clout to rezone beyond the urban edge. Although the Planning department sometimes<sup>11</sup> opposed such development (in support of compaction) eThekweni's decision was, in most cases, to facilitate these developments through infrastructure provision. The debate then revolved around proportional payment for new infrastructure.

- Political representatives of the poorer and spatially peripheral communities actively promote development in these outlying areas which supports dispersal rather than compaction.
- The plan relies on a fundamental restructuring of the public transport system which challenges the dominant role of the black South African controlled taxi industry. To date, this restructuring has not taken place in any meaningful way. The taxis are still the dominant mode and rail has seen few improvements.
- Due to the massive political pressure on housing delivery, the SDF simply incorporated the public housing plans.<sup>12</sup>
- Little economic activity materialised in township/informal nodal areas. The risk/return ratios on private investment did not support development within poorer areas. Only in the last 3 years has private investment here increased.<sup>13</sup>
- Housing has mostly failed to penetrate the more central accessible areas<sup>14</sup> because of the policy decision to upgrade settlements 'in-situ'. The high cost of more accessible land has meant that, in order to be financially viable, housing would have to be at much higher densities. Higher densities would lower the land cost per housing unit. However multi-storey buildings cannot be financed by the subsidy because the capital costs of building are simply much higher than for single dwellings and far exceed the subsidy allocations. This reflects rigidity within the housing policy and also a short-sightedness since the continued roll out of single dwellings in peripheral locations leads to very high bulk infrastructure costs in the short term as well as high operating costs in the long term.
- The city engineers have called for greater certainty in so far as projected land-uses are concerned and a clearer indication of phasing to test the infrastructure implications and have become frustrated with the fact that the planners cannot provide this clarity. Much criticism has been levelled at the planners from the engineering side because of the many developments that have been approved run counter to the SDF vision and this has led to reduced engagement from the engineers who in some instances have asked "Does the SDF have any value?"

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championed by the Provincial Economic Department, originally opposed by Durban but finally incorporated into Durban's plans.

11. The Planning Department was by no means unanimous in its view on development outside the urban edge. The department still had sub-regional offices spread across the metro, and in these offices some planners still held parochial views that supported the development of the local area. Only in 2007 was this weakness overcome by shifting staff and centralizing certain functions.

12. Although the Planning Department had the opportunity to comment on housing projects, there was a sense that from a housing department perspective this was simply 'going through the motions' since projects were going to be located and serviced according to political imperatives.

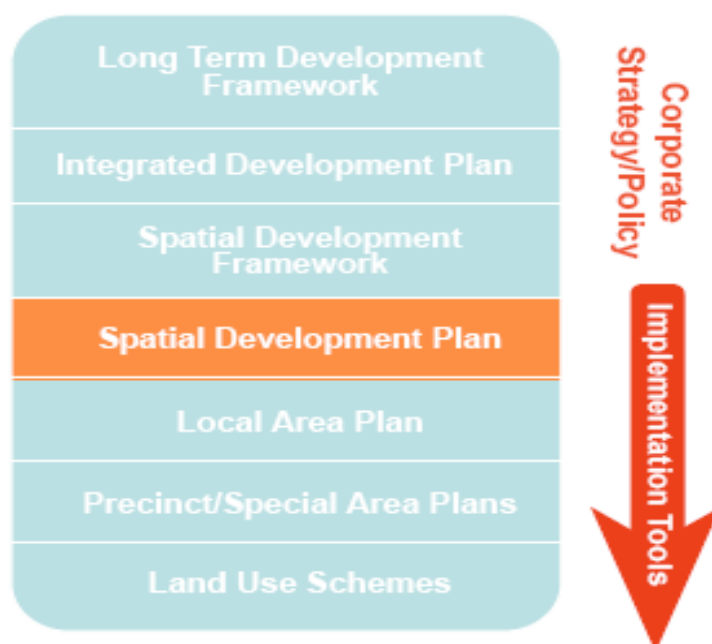
13. Dedicated area-based management has been put in place, continued funnelling of municipal, provincial and national state department capital budgets into these areas, rising local spending power due to black economic empowerment policies at a national level, and national policies directing corporates to invest in poorer areas as part of their social responsibility.

14. See Figure 9 showing housing projects.

#### 4. The ‘Missing Middle’ in Planning: Spatial Development Plans

The inability of the 1997 and 2002 SDF to guide development as intended led to the realization that there was a missing piece in the hierarchy of plans. Spatial Development Plans (SDPs) were developed to bridge the gap between the strategic/conceptual SDF and the detailed land-use schemes referred to in the municipal plan hierarchy<sup>15</sup>—see Figure 6 below.

**Figure 6. eThekweni hierarchy of spatial plans**



*Source: Corporate Policy Unit, 2008.*

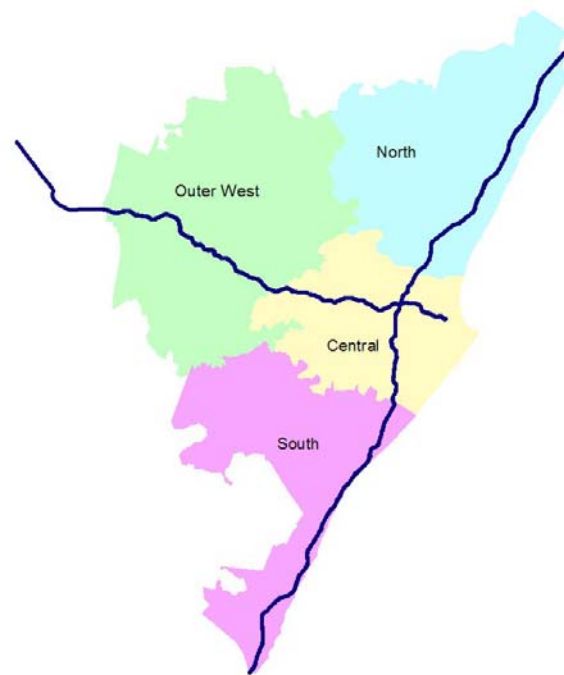
The metropolitan area was divided into four sub-metropolitan planning regions (North, South, West and Central)—seen in relation to the national roads in Figure 7 below. Since eThekweni was then a single political entity these planning boundaries did not follow the political boundaries of the previous local council dispensation. Rather the boundaries of these planning regions follow major rivers which create physical barriers between regions since there are few points where bridges are in place to facilitate inter-regional movement.

The development of SDPs has, however, not overcome the infrastructure and housing related shortcomings of the SDF.

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15. From 2002 a hierarchy of plans emerged in eThekweni. The highest level spatial plan is the Spatial Development Framework, a concept plan showing growth nodes and corridors. The next level is that of the Spatial Development Plans (SDPs) each of which cover one of the four sub-metropolitan planning regions and focus on identifying the long term carrying capacity of the region in land use terms. Below these SDPs are Local Area Plans (LAPs) which are often a grouping of functionally-linked suburbs. Here the land uses emanating from the SDPs are given more substance and clarity and the collector road alignments come into view. Precinct Plans are developed for special areas that, for example, may have heritage elements requiring conservation. The Land Use Schemes provide the detailed zonings and built form controls. To date, eThekweni has a partially developed SDF, three out of four regions are covered by SDPs, a very small percentage of LAPs are complete and the Land Use Schemes have not been reviewed to align with higher order plans.

**Figure 7. Spatial Development Plan boundaries**



*Source: Redman, 2008.*

A strength of the SDP process is that it promotes integration of disciplines since it is driven by a multi disciplinary team including development planners, environmental practitioners and infrastructure engineers.

However, the SDPs are insufficiently detailed to allow the municipal engineering departments to use this as the base for their own forward planning. To determine the infrastructure requirements of any development plan requires land-use detail including categories of industry, residential nett density and income as well as the timing of development or phasing. For a host of reasons the land-use planners find it difficult to put forward this level of detail:

- Inadequate data and intelligence on both historical and forecast market take-up of different land-use categories as well as demographic projections and the regional distribution of this growth.
- The lack of a detailed economic strategy, including a policy on industrial land release.
- The fact that the planners know that densities have to increase but that the market appetite for these higher densities has not been tested across the income spectrum.
- The four SDPs covering the metro need to be complete before making decisions on phasing since each of the four areas will impact on each other—human resource constraints have not allowed the rapid and simultaneous completion of all SDPs.<sup>16</sup>
- The lack of a clear policy direction on the future of the Durban CBD. If it is indeed the only node of regional significance as mooted in the SDF then it requires a role/branding and a massive injection of capital and renewed urban management. With the continued overall neglect and decline the opposite appears to be true.

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16. Work on the SDP covering the Central area—which is a vital element to realizing the compaction intent—has only started in 2007.

- A continued onslaught on the intent of the SDP is waged by land owners who have well researched and market-related plans that ‘contradict’ the SDPs.
- The Planning Department remains grossly under-staffed and many planners do not display the confidence to make choices within the constraints of available information nor to garner sufficient support to translate the plans into reality. To make matters worse, resources are continually diverted from SDP formulation to urgent development applications—this contributes to a loss of momentum and continuity.
- In many cases the lack of political and senior city management support has meant that there has, in many instances, been acquiescence to developers’ demands rather than ‘standing firm’ in support of the SDP. The result is that in a similar vein to the SDF the SDPs in many cases remain ‘theoretical visions’ of future land use with little confidence in them from any quarter outside the municipal Planning Department.
- Despite excess infrastructure capacities in the core areas little development has taken place here. Developers prefer greenfield (most often beyond the urban edge) to brown field locations (within existing built-up areas) since they are cheaper to develop. Land in outlying locations is generally cheaper, there are fewer encumbrances to the site such as existing buildings that must be demolished and the demand in the higher-income residential sector is in the form of large walled housing estates which require large tracts of land. The few remaining large vacant land parcels in central areas are often encumbered in that they require expensive infrastructure to unlock or are likely to be subjected to lengthy environmental impact assessments.
- The development and review of land-use management systems to capture the intent of the SDPs has not occurred and this is a fatal flaw in implementing the hierarchy of plans.

## 5. Infrastructure Systems Reaching Capacity

Despite municipal engineering departments completing strategic planning for the medium and long term development of their networks, the municipality has in recent years faced infrastructure capacity limitations in a number of regions. Firstly, the lack of a clear long-term city-development plan has meant that engineering departments have made their own ‘best guess’ assumptions of where growth is likely.<sup>17</sup> Secondly, inadequate commitment of funds and human resources to implement these infrastructure plans has, over the years, led to a decline in the ability to serve major new developments at short notice since there are now fewer capacity ‘excesses’ to tap into. Road and sewer treatment capacity have been particularly prominent in this regard since they often have lead times up to five years<sup>18</sup> for the construction of treatment works and major roads. Maintenance of existing networks has also been grossly inadequate for more than 10 years and this neglect is now showing itself and will in future years limit the ability to intensify development in currently built up areas where ageing infrastructure is present.

Ironically infrastructure capacity limitations have in some instances<sup>19</sup> become more effective in containing urban growth beyond the urban edge, when compared with the success of any municipal development plan.

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17. In fact this has contributed to the disintegration of municipal infrastructure planning since there is no common demographic and land-use base on which long-term planning can be based.

18. This includes Environmental Impact Assessment, putting the project out to tender, design and construction.

19. In the case of large developments where the cost of new infrastructure could be spread over thousands of units this cost was not as prohibitive as for small and medium size developments. In another instance an, albeit

## **6. Recent Processes to link Spatial, Housing and Infrastructure Planning**

The following section documents more current processes involving the use of model building and Geographic Information Systems analysis. These processes have fostered bold decision-making and have forged improvements in critical areas where sustainability is in question. A development levy model is discussed as a tool for improving equity in infrastructure endowments. This is followed by the ‘unblocking development’ project since this process used the development levy model to assist in making decisions about where the city should invest in infrastructure. This is followed by discussion of the cost surface model and how it is making sustainability improvements in the realm of public housing. Finally, the accessibility model is being used to calculate backlogs in social facilities and to determine the most optimal location of new facilities.

### **6.1. The formulation of a development levy model**

The municipality, faced with substantial housing and servicing backlogs has been placing a greater burden on private developers to pay for all new infrastructure that serves their developments. There is an increased occurrence of this due to the poor alignment between development and infrastructure plans. Determining what infrastructure is required occurs mostly on a project basis and this has led to increasing animosity between municipal departments and developers, the latter being under the impression that there is an uneven application of charges between developments. There have been a few instances where ‘development precincts’ have been assessed and a general development levy applied across the precinct. However the calculation of levies requires skilled staff to be dedicated to this task which the municipality cannot afford.<sup>20</sup> To make matters worse, there have been examples where levies have been under-estimated and this has placed a further burden on municipal finances.<sup>21</sup> A development levy model is now partially developed to deal with this challenge. Levies are proportional to the load placed on infrastructure systems by each development application.

### **6.2 ‘Unblocking’ development**

Developers are increasingly opposed to paying for new infrastructure arguing that the income that eThekweni derives from property rates ought to cover this.

As noted before, the edge of the built-up metropolitan area is the most attractive for developers since here lies virgin ground without the encumbrances faced when developing within currently built up areas. However, this virgin ground by definition has little infrastructure present and development here is also contrary to the SDF policy. The lack of infrastructure in these ‘city-edge’ areas has been viewed by developers and land owners as ‘blocking development’ and in mid-2007 the civil society bodies representing business and property interests brought pressure to bear on the municipal administration. In response, an exercise of modelling the infrastructure impacts of the land uses proposed with the SDPs was initiated in order to determine the extent and cost of the required infrastructure and to identify critical infrastructure projects. This process became a vehicle by which spatial planning and infrastructure planning have become more closely aligned in certain regions.

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temporary, moratorium on the use of sewer treatment ‘package plants’ in areas without water borne reticulation, held back development beyond the urban edge which supported the SDF intent.

20. For approximately the last five years the municipality has lost a large number of skilled professionals to the private sector and through emigration.

21. In the case of Hillcrest to the west, a road infrastructure levy was set at R10,000 per house, but subsequent calculations revealed that this figure ought to have been closer to R40,000 per house.



Planning Department officials provided the SDP land-use picture including development densities for the North, South and West regions.<sup>22</sup> The three regions were compared on the basis of the 'yield' of different land uses, the extent of current and likely future private development pressure, the public housing yield, the modelled cost of infrastructure required and the estimated rates income.

The conclusion drawn from GIS modelling is that development of the North Region is most preferable from a cost versus return perspective. The North is projected by 2030 to house 41 per cent of the metropolitan population increase and 64 per cent of the public housing (53,000 units), 88 per cent of new mixed-use and 34 per cent of new industrial land use. Economically, the North will experience the most growth due to the new international airport (Dube Trade Port) being constructed here and the associated private sector industrial, commercial and high income residential developments. A capital expenditure of approximately R9billion<sup>23</sup> yields an estimated rates income of R900 million.<sup>24</sup>

### *6.2.1. The North region in more detail*

The North region has four major sewer catchments<sup>25</sup> which require individual treatment systems to be developed (see Figure 8 below). To utilize the treatment capacity of one catchment for development in another catchment<sup>26</sup> is expensive, inefficient and sometimes requires major new bulk work to be undertaken. Hence the principle of sequential and full development of each catchment was agreed. Land take-up was considered in more detail in a phased manner in the years 2008–2011, 2012–2016 and 2017–2030. The land take-up particularly in the 2008–2011 phase was characterized by high levels of certainty, i.e. projects currently being assessed by the city or those in the pipeline, rather than relying on 'proposed land uses' from the SDP. Post 2011 land use also became more realistic as priority private sector development areas were identified rather than simply relying on proposed land uses within the North SDP. It was assumed for example, that land adjoining the new airport, coastal land with sea views and land around existing corridors and nodes would be developed first. Municipal plans for building public housing were also factored in with a reasonable certainty of phasing. Once the land use take-up had been defined, the infrastructure impacts were modelled in order to understand the magnitude of the additional future load on infrastructure networks. A modelled capital cost was computed.

The Ohlange catchment is partially developed and contains the majority of the public and private development in the 2008–2011 phase (see Figure 8). Despite this catchment being the sequential catchment, infrastructure capacity is constrained and this requires an urgent intervention. The load that the proposed development will place on infrastructure was compared with the current excess capacities of various networks. In discussion with line departments, a critical list of projects was identified that would provide the additional capacity required to 'unblock' the catchment. It was found that the upper Ohlange catchment can deal with all the public housing proposed to 2011 and there is no new infrastructure to be

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22. The Central regions for which a SDP has yet to be compiled was not available in the form of a future land-use scenario. This is a notable missing element since under the principles of densification, public transport viability and infrastructure demand management the development-intensification of the central core is a priority.

23. In 2007 prices.

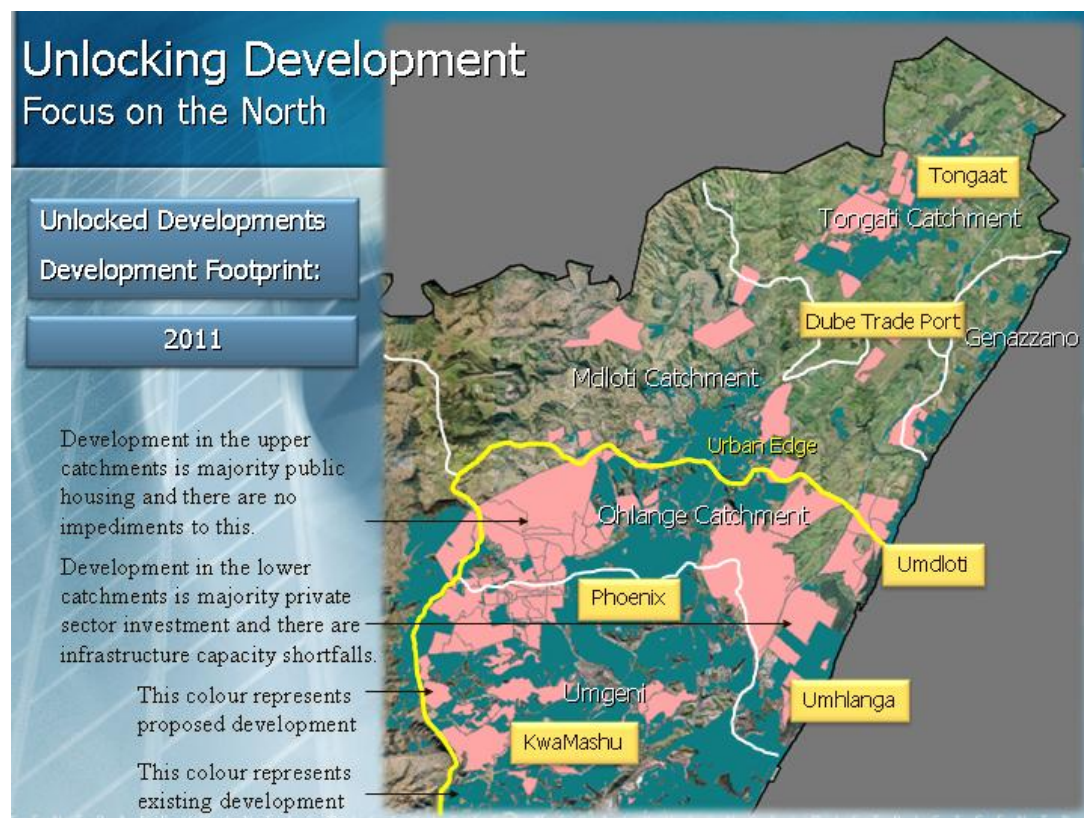
24. Based on municipal valuations which are substantially lower than market related values.

25. Umgeni, Ohlange, Mdloti and Tongati catchments.

26. i.e. inter-catchment transfer of treated sewerage effluent.

built. However the lower catchment dominated by private sector investment<sup>27</sup> has bulk road and sewer shortfalls, certain of which have not been catered for financially on the city's 3 year capital budget. These additional project capital costs have, as a result of this exercise, been included in the city budget and the project development will begin as soon as possible with a view to coming on stream in 2011 when certain large developments will be complete and will require sewer connections and road access and capacity. However there is no room for engineering project implementation delays otherwise the city will simply have to halt the occupation here of newly built houses and offices around 2010/2011.

**Figure 8. North Region: 2011 development footprint**



Source: Magill, 2007.

This process has thrown into stark relief that the city needs a vision of spatial growth that is shared between planning, housing and the infrastructure sectors within the council, by the city's senior management and politicians, and by major land owners and civil society groups. Current planning and decision-making on major land use and infrastructure development-directions should be made for 2050 and beyond, not for 2011!

The unblocking development project has also reinforced the urban edge concept and has shown the financial impact of 'leap frog' development. To keep infrastructure costs to a minimum the city must commit itself to sequential development of catchments outwards from existing built up areas and make some effort to concentrate development in certain catchments

27. Private investment generates income for the municipality via property rates while public housing generates no rates income and is a financial burden. In this context the municipality must from a financial sustainability perspective, achieve a balance between the two.

in order to achieve nearly full take-up of land in the catchment. It has for example been shown in the northern region that if the Mdloti catchment is developed prior to the Ohlange catchment (which is only partially developed) there is a 26 per cent premium.<sup>28</sup> Similarly if the Tongati catchment is developed prior to the Mdloti, 31 per cent more will be paid in infrastructure capital costs.

The “unblocking development” exercise has strengths and weaknesses. Value has been added through compiling all available information, making some required assumptions and presenting the results in the form of maps and tables that are easily understood. This has assisted the Planning Department to commit to a course of action since the implication of not making explicit choices will result in holding back metropolitan growth through limiting the growth of infrastructure. It can however be argued that development continues to be driven north more by developer-push than by Planning, particularly given the importance of a major land owner in driving development there. On current projections the North with its wide coastal plain<sup>29</sup> seems likely to grow faster than other areas and the growth forecasts are supported by development trends over the last five years. Provincial government is also increasingly seeing economic growth as essential to dealing with unemployment<sup>30</sup> and to the realization of the developmental agenda of local government. A concern is that the potential of the central area has not been tested and that by committing to a northern growth path there is little likelihood of extensive development and compaction of central areas. Yet the market has shown little interest in central areas for more than 10 years, despite a number of large public sector projects in these areas.

### **6.3 Public housing and the “cost surface model”**

In South Africa in general and in the Durban metropolitan area in particular—during the post-apartheid era—planning of public housing has ‘led’ and infrastructure planning and spatial planning has ‘followed’. Planning has mostly incorporated Housing Plans with few modifications. The way in which the public housing subsidy is apportioned emphasises the housing unit itself and bulk infrastructure costs are not taken into account. The cost of bulks is then largely borne by the municipality. The value of the model to be discussed below is that it shows the costs of this infrastructure in various locations and often peripheral locations are much more expensive to provide with services. Hence the model allows for an argument to be made about better location of public housing.

Infrastructure departments have incurred massive capital expenses to serve housing projects which, due to their location, require dedicated bulk infrastructure. These ‘bulks’ are un-economic since they either cannot serve other development or are in areas where development is not expected for 20–30 years and hence are considered premature. Political pressures for maximum housing delivery and for projects scattered across electoral wards<sup>31</sup> has meant that in any single year there is housing construction across the metropolitan area. The sanitation engineers prefer to build efficiencies into their infrastructure networks which translates into a preference for substantial blocks of development in a single catchment<sup>32</sup> rather than a host of

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28. This premium is attributed to road and public transport infrastructure which must straddle the undeveloped catchment in order to serve the catchment beyond.

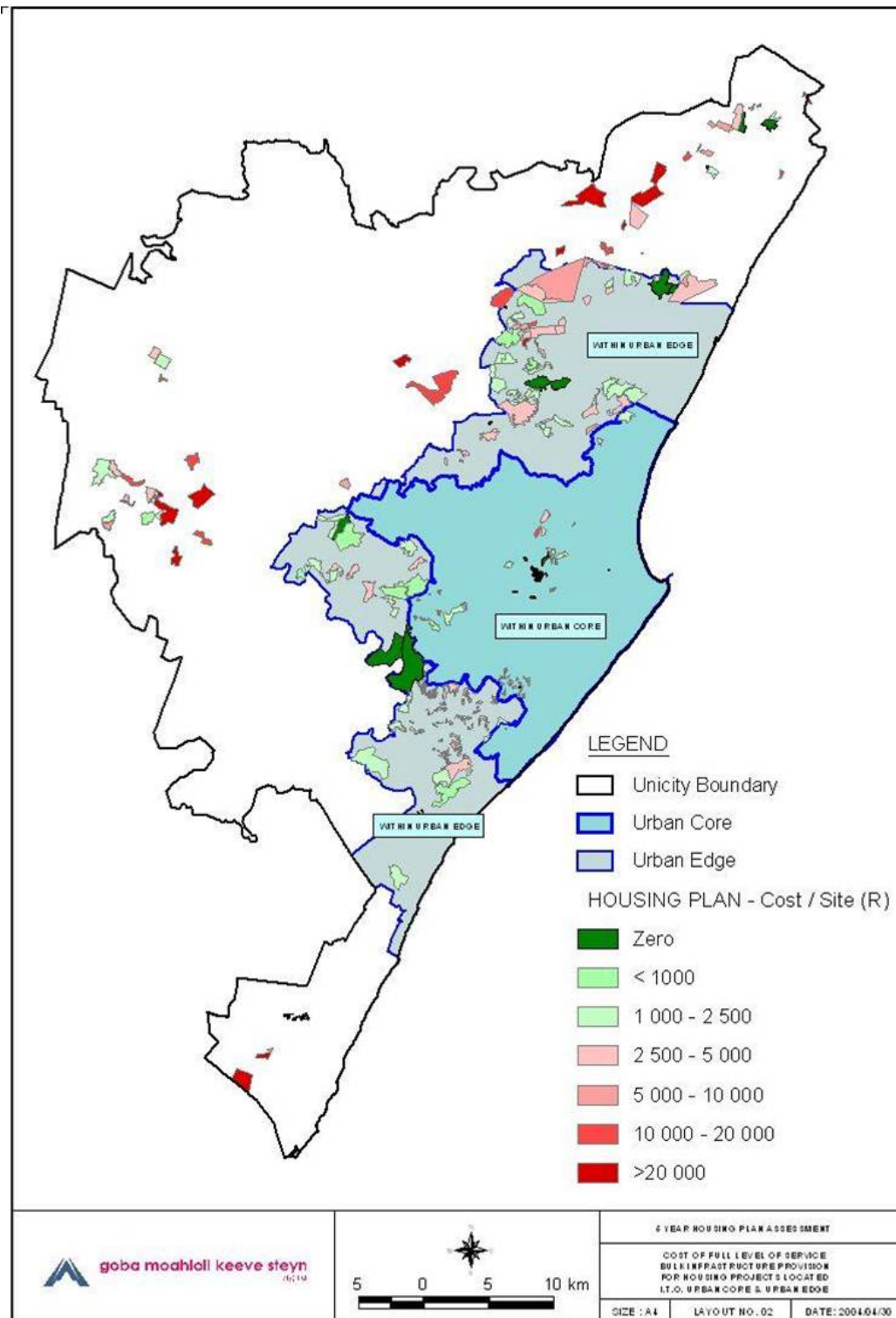
29. With relatively flat and easily developed land, compared to the severe topography inland of this plain.

30. And the host of social ills associated with this including the high rate of crime.

31. Politico-geographic boundaries. There are 100 Wards in Durban and each has a Councillor as a political representative.

32. i.e. the development can be served by a single sewer treatment facility.

**Figure 9. eThekweni Housing Plan: project bulk infrastructure costs**



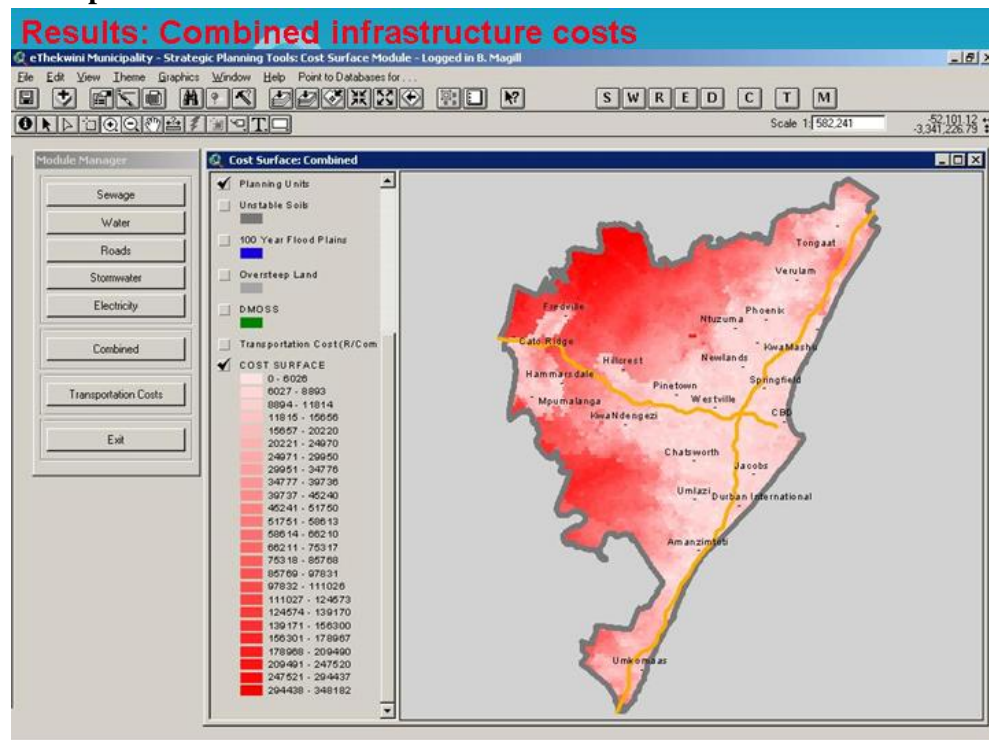
Note: Assumes that all projects will have a full level of services, values reflect capital costs in 2004 prices and are in South African Rands, approximately R7.50/USD.

Source: Magill, 2004.

projects dispersed across catchments which require multiple treatment facilities. Also, the closer the projects are to existing infrastructure networks, the better, since the cost of bulk extensions is kept to a minimum and therefore the cost per unit for providing water-borne sanitation, is reduced. Figure 9 shows clearly that fully serviced projects in peripheral locations have higher bulk infrastructure costs than centrally located projects. These infrastructure costs must be financed from the municipal budget or from national infrastructure grant monies. The latest 2008 housing subsidy review is suggesting that the entire subsidy be utilised for the top structure (i.e. the house) which means that the magnitude of bulk and reticulation costs are likely to become even more critical for the municipality as this financial burden is no longer shared between the municipality and national government.

Calculating the bulk infrastructure costs for every potential housing project can be time-consuming and costly and therefore generally occurs only at project packaging stage rather than at the planning/feasibility stage. This provided the motivation for the development of a model that could ‘predict’ the cost<sup>33</sup> of bulk servicing of housing projects anywhere within the municipality and could provide this information ‘at a glance’.<sup>34</sup> A Geographic Information System (GIS) layer or ‘surface’ was created reflecting the cost of bulk infrastructure provision—hence the naming of the model—“Cost Surface Model”. Figure 10 below shows the increase in the cost of providing bulk infrastructure as one moves into more peripheral locations. The dark red areas represent the areas with the highest costs. Figure 11 shows this in more detail.

**Figure 10. Cost Surface Model thematic map showing cost of bulk infrastructure for the metropolitan area**



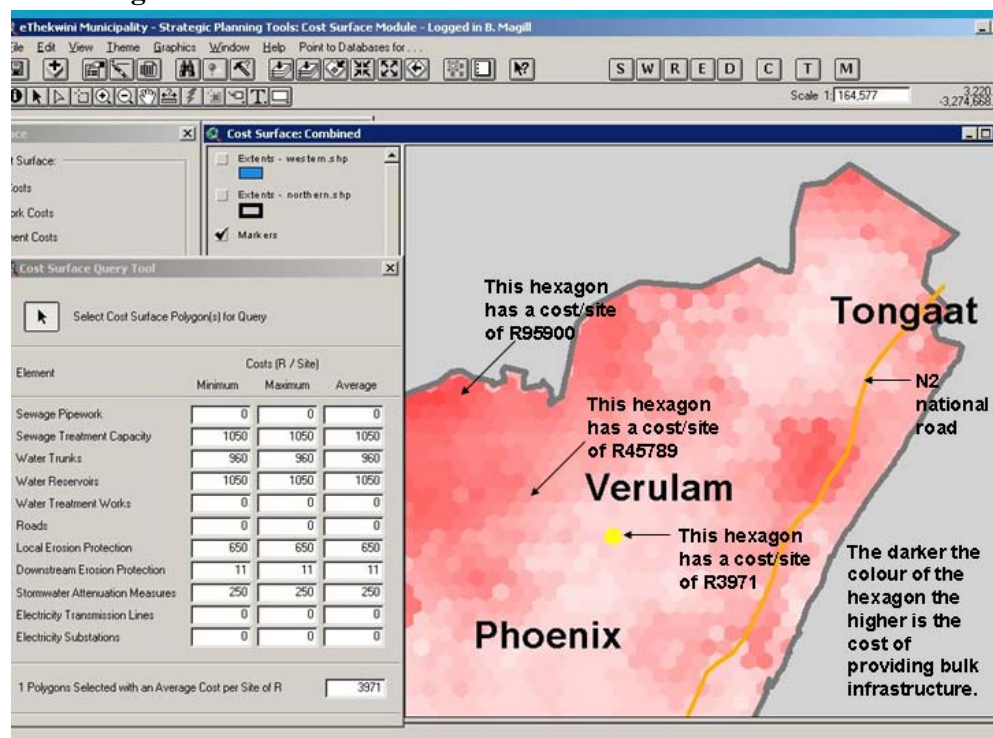
Source: Magill, 2004.

33. This is not a costing based on a detailed network design but rather a cost at a strategic city-wide level.

34. Converting complex engineering network data into 'information at a glance' has meant that this information is now accessible to non-engineers. In this way the model has assisted the 'conversation' between disciplines and is contributing to enhanced integration.



**Figure 11. Cost Surface Model thematic showing cost of bulk infrastructure for the North Region.**



Source: Magill, 2004.

It has taken a few years for the model's accuracy to be improved and for it to be utilised. Recently, the 2007/2008 projects within the Housing Plan have been assessed to highlight or 'flag' projects with very high bulk costs. Detailed engineering design costs are then calculated for these 'flagged' projects and, where necessary, the level of service is modified or alternate locations sought. In this way the model is providing a strategic level input to the medium and long term budget planning within eThekweni since with the aid of the model it is possible to calculate the cumulative cost of infrastructure required to serve the more than 700 proposed projects within the municipal Housing Plan. A further advantage is that any savings made on very expensive projects affords the opportunity of generating higher site yields elsewhere, thereby potentially making greater inroads into eradicating housing backlogs.

The cost of bulk infrastructure is now playing a greater role in planning for housing. The Housing Department is utilising the model as a tool to perform strategic-level cost assessments of bulks for new housing projects and as an input to decision making around potential locations for new public housing. Through drawing attention to the fact that housing projects in peripheral areas have high infrastructure costs (when fully serviced), this has provided further impetus to the formulation of alternative housing typologies<sup>35</sup> at higher densities in more accessible locations. In instances where bulk costs for each housing unit exceed say R20,000–30,000 there appears to be an opportunity to rather pay more for land closer to development nodes/corridors and, by virtue of improved proximity to infrastructure networks, pay less for bulk services.

35. This research work is currently underway.



The idea that low cost housing ought to be consistent with the SDF—i.e. close to nodes and corridors—has not materialized to any significant extent because:

- informal housing is upgraded in-situ which mostly means peripheral locations;
- land cost has worked against more central locations;
- opposition to low cost housing projects proposed close to established suburbs;<sup>36</sup> and
- extreme political pressure on housing delivery.

As a result there has not been a rigorous assessment of the Housing Plan by the Planning Department with a view to aligning it with planning intent. Rather it appears as if the Housing Plan is being implemented year on year and will simply be incorporated within the spatial plans with few substantial modifications. In some instances the planners do not want urban housing to encroach on rural landscapes and have used the Cost Surface Model as a motivation. The model provides useful ‘hard engineering’ data to back up softer arguments about the loss of valuable ‘landscapes’ and ‘sense of place’.

#### **6.4. Accessibility model**

The adequate provision of social facility infrastructure to housing projects is being facilitated by another model called the Accessibility Model. It has been developed to consider the supply of and demand for social facilities across the metropolitan area and to further understand the future social services requirements of the Housing Plan. Planning comment on individual housing projects will mostly not factor in the additional demand created for new social facilities since individual housing projects in themselves often do not require additional facilities of the type that display high thresholds such as schools or swimming pools. However when housing projects are clustered then new facilities are warranted. For this purpose a strategic assessment has been undertaken to understand the social facility demand generated by the entire Housing Plan. It has been found that in many low income housing areas there is insufficient vacant land available to accommodate facility needs and as a result vacant land now has to be found further afield as well as new models of multi-use of available space having to be considered. The Accessibility model is also furthering the spatial intent of clustering of public investment in nodes and along corridors. The model has—through the formulation and use of standards<sup>37</sup>—signified a move beyond the very broad and conceptual spatial planning that dominated the post-apartheid era, and has recognised the value of a ‘harder’ approach to planning and the use of GIS and modelling to generate quantitative information to aid decision making.

### **7. Conclusion**

In the last 20 years spatial planning in Durban has progressed from master planning, with its inaccuracies of prediction and its rigidity, to framework planning that has been shown to be too ‘loose’ or conceptual in nature. In recent years processes have started to shift to ‘harder’ more numerically-based efforts with a stronger use of GIS and modelling. These models have allowed improved integration of the planning for infrastructure, public housing and social facilities and spatial development planning. The models have been used to present and analyse complex issues in a clear and structured manner and thereby have assisted in making

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36. Residents raise their opposition in the public participation processes associated with the Environmental Impact Assessment process and this makes getting approvals more difficult and hence time-consuming. This leads to the Housing Department preferring locations where these obstacles will not be encountered.

37. The necessity and value of standards is shown further in Green et al, 2008.

better decisions jointly amongst the various actors. Thus, although highly quantitative and relying on standards and assumptions, there is a recognition that the urban system is highly complex and that one must temper modelled outputs with the local knowledge of sector experts and the preferred long term outcomes.

In Durban developers are used to a developer-driven approach rather than a plan-driven approach. The development of a common future spatial vision that is shared by various stakeholders within and outside local government is essential. Building this kind of consensus is arguably the most critical element of what planning needs to do if it is to succeed. Commitment to the City Plan and sufficient detail within this plan will greatly assist the effective long-term forward planning for infrastructure.

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