

SUSTAINABLE RESOURCES USE PAPER: THEME - URBAN FORM
Prepared for the Sustainability Institute

Cape Town Den[city]: Towards Sustainable Urban Form

Final Draft

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"We are far from having a shared vision of an ideal human environment. It is said that world sustainability will depend to a large degree on what will happen in cities, particularly in fast-growing cities in developing countries. Yet, what is a sustainable city?" (Peñalosa, 2007: 319)

1. Introduction

The majority of discourse on ‘sustainability’ places emphasis on the environmental agenda (‘green and brown’ issues): inclusive of pollution, energy and water consumption, urban waste, ecological footprinting and so on; macro-scale processes, issues of governance and institutional capacity (Burgess *et al.*, 1997; Keiner *et al.*, 2005).¹ Although vital for dialogue, most of this theory largely sidelines the challenge of *designing* cities as liveable, adaptable environments, abundant in culture, heritage and identity (Zetter and Watson, 2006). This discussion paper not only intends to address achievable goals towards sustainable urban form through the concept of *densification*, but also promotes sustainability from a design perspective.²

The paper asks the following key questions; does densification improve or decrease sustainability, and why is this the case? Conversely, how does urban sprawl promote or prevent sustainability, and why? This leads to the question, how can urban development processes provide sustainable approaches to designing cities, neighbourhoods, places and spaces? The paper focuses on Cape Town and environs.

2. Challenging Urban Form in Cape Town

This paper argues that there is a direct relationship between *urban form*³ and *density*⁴ in an urban context. Cities are composed of multiple urban forms including buildings, roads, parks and infrastructure. Unfortunately, buildings and infrastructure yield some of the largest global carbon emissions.⁵ The urban systems⁶ that support such buildings and infrastructure rely on extensive energy and water consumption, generate waste, air and water pollution, along with producing harmful by-products (Power, 2007). Nevertheless, buildings and infrastructure also provide venues for learning, shelter for families, spaces for recreation and places for income generation, which are vital for vibrant urban environments. These two aspects of urban form therefore have to work towards a balance between the urban environment and its capacity to absorb built form, taking account of efficiency, cost effectiveness, limited resources, fair distribution and equitable access.

A major problem of South African cities is the type, nature and character of urban form. Sennett (2007: 292) argues that “Today’s ways of building cities – segregating functions, homogenizing populations, pre-empting through zoning and regulation of the meaning of place – fail to provide communities the time and space needed for growth.” Cape Town is no exception with its promotion of modernist settlement patterns that resulted in inappropriate urban forms (see Section 2.1) exacerbated by low densities. Its urban gross base density is 13 dwelling units (du’s) per hectare (ha) which is way below the international urban gross base density of 25 du’s/ha to support at the very least a viable and efficient public transport (PT) system (CoCT, 2008). Current planning patterns in Cape Town therefore do little to encourage a compact city form to promote sustainability. A further challenge to crafting sustainable urban form is social perceptions and individual aspirations towards suburbanisation given the familiarity of this settlement pattern and form of Cape Town.

¹ For a critical review on ‘sustainability’ see Marcuse, 1998; and Satterthwaite, 1997.

² Urban planning and design concerns the arrangement, appearance and functionality of cities, and in particular the management and shaping of urban *public space* (i.e. the ‘public environment’, ‘public realm’ or ‘public domain’), and the way public places are experienced. Public space includes the totality of spaces used freely on a day-to-day basis by the general public, such as streets, parks, bicycle ways, markets and public infrastructure (i.e. PT facilities, bicycle storage, trading, ablutions, town halls, markets etc.).

³ *Urban Form* is defined as the shape or pattern of settlement in the landscape in two-dimensional terms. In three dimensions, it refers to the “outcome of structure, function and process” (Dewar and Todeschini, 2004: xvi).

⁴ *Density* simply refers to “the amount of available space per person” (Maas *et al.*, 1998: 1). *Densification* as defined by the City of Cape Town (2008: 4) is “the increased use of space both horizontally and vertically within existing areas/properties and new developments accompanied by an increased number of units and/or population thresholds.”

⁵ Cities consume about 75% (50% buildings – construction, lighting, heating, air-conditioning, electricity based appliances; 25% transport; and 25% industry) of world energy (of which 79% is from fossil fuels (Ward, 2008: 4)) and contribute an equal amount to global pollution (Battle, 2007: 391). In the United Kingdom for example, buildings and infrastructure produce 50% of carbon emissions (Power, 2007: 364). One ton of CO₂ emissions occupy 556m³ of space at 25°C at standard pressure. An Olympic size swimming pool is 2500m³. The average South African household consumes 12.81 tons of CO₂ per year. This can fill almost three Olympic size swimming pools (<http://www.capetown.gov.za>).

⁶ Urban systems include activities involved in trade, commerce, services, manufacturing, and transport and so on.

2.1 Fragmented Cityscapes and Urban Sprawl⁷

The current form of urban development in Cape Town is grossly unsustainable as a result of modernist (apartheid) 'reactive' planning and design practice. An alarming aspect is although national, provincial and municipal policies support and encourage sustainable human settlements,⁸ both the public and private sector continue to roll out inappropriate urban form. Between the years 1985 to 2005, Cape Town has increased by 40% in area.⁹ However this growth has been lacking in coordinated direction, management or alignment with infrastructure provision and capacity and appropriate spatial planning (CoCT, 2006). Transport is still dominated by the private vehicle as opposed to promoting clean, efficient, affordable and safe use of public transport (PT) and non-motorised transport (NMT) that are inherently associated with more appropriate land uses. The result for Cape Town has been severe impacts on the natural and spatial environment with negative social and economic conditions.

A 2001 Socio-Economic status index by suburb (refer to Figure 1) for Cape Town reveals a city of immense inequity. Low-income settlements are generally inappropriately located, poorly adapted to local needs and badly planned. The majority of the households living in absolute poverty are clustered in the Metro South-East which experiences the highest (growing) density. In addition, there is an increasing pattern of low-income housing being developed on the far periphery of the city on greenfield sites. Formal housing in these low-income areas is largely based on standardised concepts and formulae obsessed with quantity and not quality of the home or the public realm. Informal housing is relatively dense, but these areas are often deprived of adequate water supply, sanitation, solid waste management, education and healthcare. The middle-income suburbia circles this low-income cluster to the north, west and east in a horse-shoe type band.

The wealthy in Cape Town, however, continue to build unsuitable, dispersed developments on 'greenfields' that should really remain productive land in the urban economy. This can be seen in the subdivision of large plots in Constantia and Durbanville or development of residential 'green' estates on or beyond the urban edge, for example in the Winelands. Wealthy estates are often promoted on the basis of 'development' for the rural poor or farm workers' where this sector shares in the 'benefits' of developing land that should be reserved for food security and the rural economy. Up-market housing is also being developed in some of the best resourced parts of the city, for example, in the urban cores in the form of middle and high income apartments. This appears in response to a market-led 'need' for security, privacy and private investment. Consequently, we may be "trying to solve new problems with outdated perceptions and planning" (Geis & Kutzmark, 2006). In Cape Town, 20% of the housing value in the city takes up 40% of developed land (CoCT, 2006: 26).

Such extreme housing conditions between the wealthy and the urban poor are spatially, financially and ecologically flawed from the process of public participation right through to construction, occupation on the ground and long term sustainability. Associated with these residential patterns is the predominance to develop separate, internalised shopping malls, accessible mainly by expensive motorised transport. There is also the decentralisation of retail and business to separate entities as is experienced by businesses moving out of the inner city to places like Canal Walk.

⁷ *Urban sprawl* generally has negative connotations due to extreme health and environmental concerns, but it is defined in this paper as described in CoCT Report (2006: 78) as the "gradual and uncontrolled spread of urban areas into the surrounding natural areas."

⁸ Sustainability principles are also encapsulated in other policy such as municipal level Integrated Development Plans (IDP's), at provincial level in the form of the Western Cape Sustainable Human Settlement Strategy (WCSHSS) (DLGH, undated) and Breaking New Ground (BNG) (South Africa, 2004) at national level. The Breaking New Ground approach to housing delivery seeks to address the fundamental mismatch between delivery and development in the urban environment. This policy is a comprehensive and approved housing delivery policy programme which acknowledges the need to see housing as an instrument to spatial restructuring by creating sustainable human settlements. However, as stated by Mchunu (2006), South Africa is producing new forms of fragmentation, exclusion and conflict based on wealth rather than along racial lines (e.g. gated communities, road closures, business parks, shopping malls) with little regard for culture and public space, which is far from developing sustainable human settlements.

⁹ From 1977 to 1988 Cape Town developed by an average of 701ha/year. In 2005, the city was developing at a rate of 1,232ha/year (CoCT, 2006: 25).

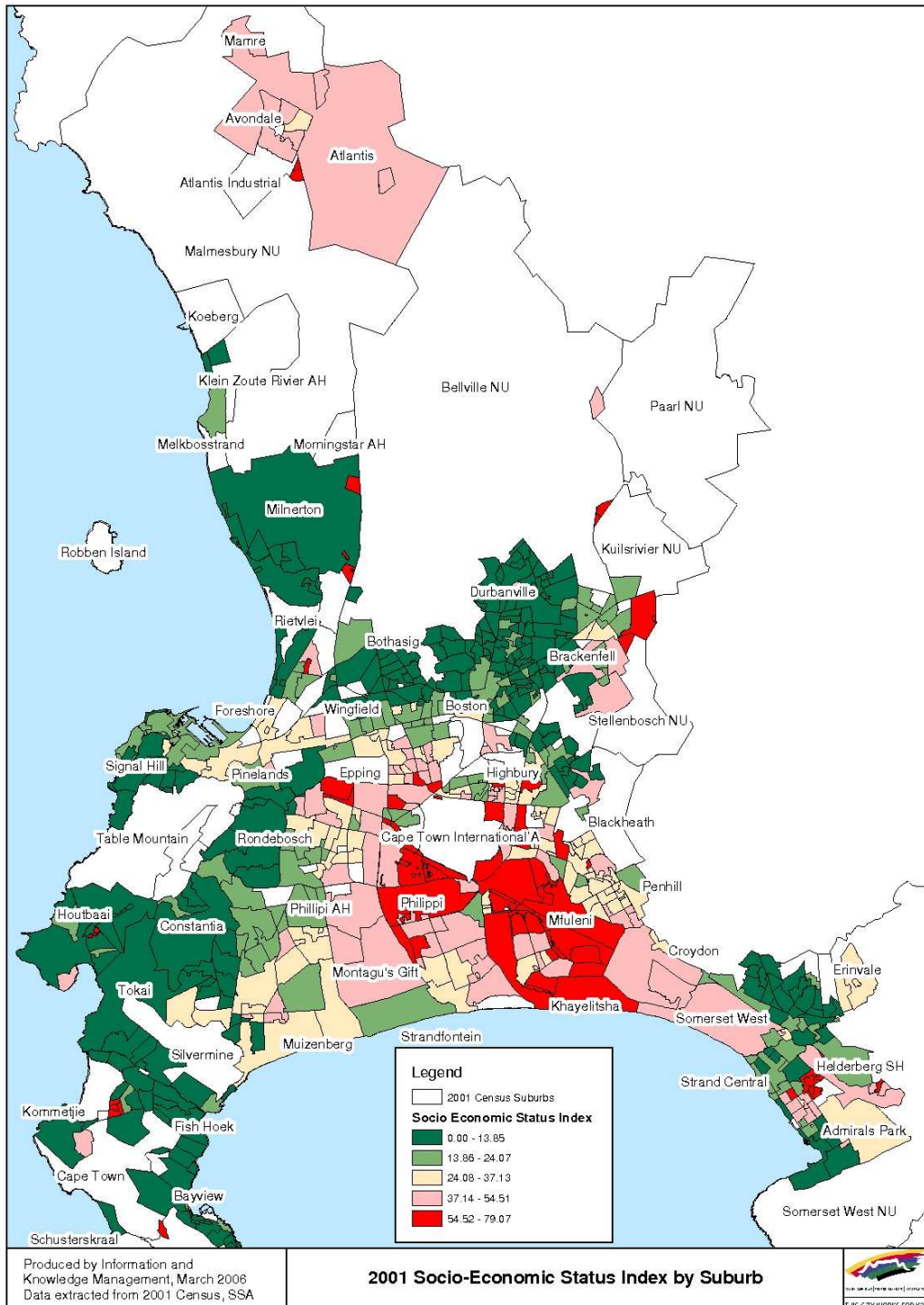


Figure 1 (see - www.capetown.gov.za; CoCT, 2006: 16)

Consequently, urban sprawl in Cape Town has resulted in a spatial pattern and urban form that is characterised by:

- a *population that is widely dispersed and spatially disproportionate* in terms of social development planning and economic possibilities: the urban poor are pushed away from the central business district (CBD) and employment areas; the wealthy occupy key valuable sites adjacent to mountain and sea; and suburbia 'in-between' which has a low-density, single-dwelling residential pattern. This reveals a critical lack of integration of different income-groups (refer to Figure 2);
- a clear *separation of spaces* for living, working and shopping, with limited facilities within acceptable walking distance in both the wealthy and poor areas of the city;
- *discontinuous roads structure* (for predominantly motorised transport) marked by very large super blocks and limited access, particularly in the lowest income areas. A large majority of the population are reliant on travelling long distances at great expense to access opportunities. These environments require ongoing investment in infrastructure; and
- a *move away from key activity hubs*, such as the central inner city, which is becoming an exclusive enclave for the higher-income sector.
- The *continued reinforcement of inequitable spatial patterns* as a result of the location of both public and private investment.

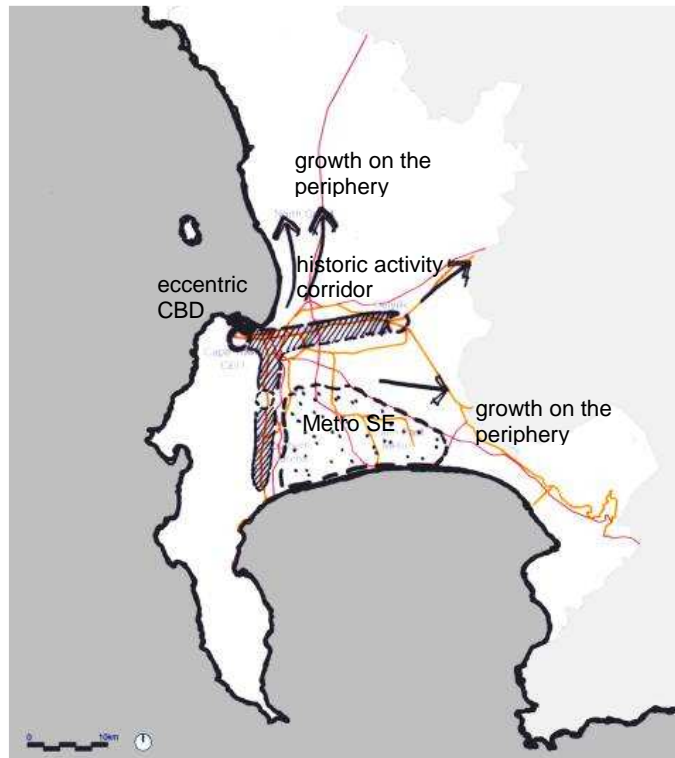


Figure 2: Dispersed Spatial Structure (NM & Associates)

Such physical landscapes monumentalise separation over inclusion, in which public space fails to perform its democratic potential as a place of exchange, tolerance and healing (Mammon *et al.*, 2008). We need to reverse this trend of fragmented enclaves that promote a discontinuous urban spatial structure. Such environments are unsustainable and socially disabling.

2.2 Densification and Urban Form

Cape Town has a relatively low urban density (measured in people per km²) compared to other world cities (refer to Figure 2). Densities recorded for world cities include New York (9,610) Shanghai (2,590), London (4,800), Mexico City (3,700), Johannesburg (1,960) and Berlin which has 3,810 people per km² (Burdett and Rode, 2007: 246-248). In 2005 Cape Town's density was 1,252 people per km² on the basis of 3.1 million people, measured against built and non built areas (Robertson & Dalvie, NM & Associates Planners and Designers, 2008). While significant residential and commercial/retail development has occurred in the Cape Town inner city area, urban densities and residential densities in particular, are still relatively low. Furthermore, this residential market has targeted middle to upper income professionals, yuppies, and foreign owners whilst excluding local families and middle to lower income households that can assist to build urban thresholds for sustainable urban development.

Densification is happening in reverse mode in Cape Town. Instead of densifying areas where urban resources are abundant and easily accessible for example, around key urban nodes and along major corridors or axes, densification currently happens mainly on the outer edges of the city. Areas such as Kensington and Rosebank that are well-located and resourced local areas in Cape Town have gross dwelling unit densities (du's) of approximately 11 and 44 per hectare respectively (CoCT, 2008: 10), whereas areas such as Mfuleni on the periphery of the city has a gross density of approximately 55du's per hectare. The recently completed housing in Joe Slovo¹⁰ which one can argue has limited proximity to urban opportunities and is not as well resourced as a local area when compared with Rosebank, has a gross density of 120du's per hectare. Average dwelling unit densities for Cape Town's informal settlement largely located on the peripheries of the city, are 100du's per hectare according to the City of Cape Town (CoCT, 2008: 10). This reverse mode densification has resulted in a spatial pattern and urban form that:

- does not acknowledge that *land is a finite resource* and non-renewable by nature in an urban context;
- requires commuting on *transport that is unaffordable* for those living away from opportunity and does not directly support investment in a viable public transport system as a result of dispersed thresholds;
- *lacks equity* for a diverse cross-section of Cape Town's population;
- is *expensive* in terms of service and infrastructure provision; and
- *lacks a spatial logic* that facilitates economic opportunity and place-making using public structure and built form as a key ordering element.

Against this background it can be argued that densification does very little to improve Cape Town's sustainability in terms of urban form, spatial patterns and the quality of life of the majority of its citizens as seen today. In fact, latest attempts at metropolitan planning can be seen to encourage sprawling patterns towards the north of Cape Town instead of arguing for compaction (CoCT, 2006a). Furthermore, directing growth to where the airport is presently located not only encourages urban sprawl but also has major implications for the direct and indirect impact on the urban economy. The intention of promoting these new spatial patterns is to obviate the eccentric nature that currently characterises Cape Town, yet this goes against the fundamentals of the compact city that encourages sustainable urban form.

¹⁰ The N2 Gateway human settlement programme intends to enable approximately 20,000 to 22,000 households to be housed/re-housed where about 18,000 people (3,600 households) of this total will be accommodated on approximately 29ha of land (to be serviced) in Joe Slovo, Langa, located approximately 14km from the Cape Town CBD. The population size in 2003 of Upper Table Valley (comprising Vredehoek, Gardens, Tamboerskloof and Oranjezicht), a wealthy area in Cape Town's inner city located within walking distance of the Cape Town Central Business District (CBD) and covering a land surface area of approximately 114ha (City of Cape Town, 'Density by Suburb' 2003 – available from the City of Cape Town (CMC Administration) Data Base) was approximately 23,857. Therefore Joe Slovo will cover 25% of the land surface area of Upper Table Valley to accommodate the equivalent of approximately 75% of the Upper Table Valley population (Mammon *et al.*, 2008: 26).

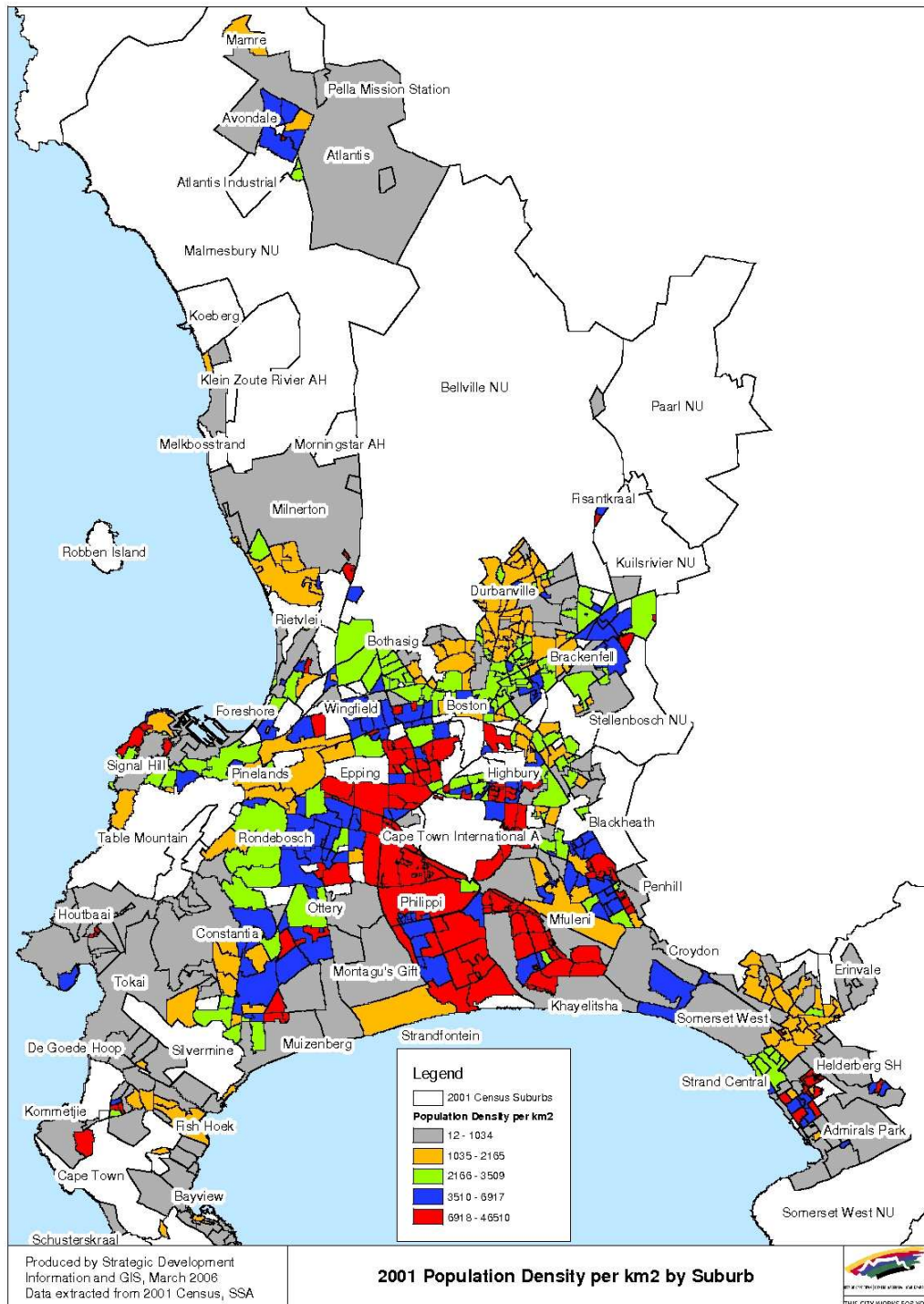


Figure 3 (see - www.capetown.gov.za; CoCT, 2006: 27)

3. The Compact City – a sustainable response to urban form

So we face challenges of fragmented, sprawling environments in Cape Town that also has added global issues such as climate change, looming food insecurity, increasing fuel prices, fossil fuel dependence and so on. When disaster strikes, the poor suffer most implying that sustainability is also about poverty reduction and working towards an equitable situation (Swilling *et al.*, undated). What does this mean for people-based urban environments and their long term sustainability?¹¹ Does it only mean reducing ecological footprints and creating zero-carbon, zero-waste environments and do we continue to limit our perceptions of sustainability to building technologies, energy efficiency and environment within a framework of economic feasibility alone? Or does it mean that we accept that we have an existing situation that although largely dysfunctional, cannot simply be abandoned but must be adapted over time to work towards zero waste, zero carbon conditions. If we argue only for zero waste zero carbon built form, we create situations for wealthy opportunists to develop landscapes in the hinterland such as golf and residential estates under the guise of ‘sustainable development’, whereas such land should strictly be agricultural and reserved for food security and productive purposes. Furthermore, built form is always founded in a landscape footprint that could potentially disturb the natural patterns and flows of systems for example, river systems especially in a landscape that is by nature open and expansive – never mind the scars created from a visual impact perspective. Aside from climate change and resultant sea level rises, the same threats are posed to our ocean and marine life where claims of development rights beyond the shore lines are being made (*Cape Times*, Thursday 26 June 2006).¹²

The **compact city** concept is supported by what Kenworthy (2006:68-69) terms ‘ten key dimensions for sustainable city development’, a key one of which is the return to ‘a compact, mixed use urban form that uses land efficiently and protects the natural environment, biodiversity and food producing areas’. Public transport, walking and cycling become key components of the city and large freeway and road infrastructure investments are de-emphasised (Kenworthy 2006: 68). Burdett and Rode (2007) takes this view further:

“At a metropolitan and regional scale, it is clear that more compact urban development provides the only sustainable answer to global urban growth. This is true not only because less sprawl leads to a reduction in energy use and pollution – and cities contribute 75 per cent of the world CO₂ emissions – but also because dense cities require less investment in public transport, infrastructure and services to make them work.” (Burdett & Rode, 2007: 22)¹³

Burgess *et al.* (1997: 121) also argue along similar lines to Burdett and Rode, where “sustainability can only be achieved through the concept of the compact city and a general spatial strategy of densification of the built area.” The ideal of a mixed-use, accessible, financially viable and sustainable city, in the concept of the ‘compact city’, is contrary to what one currently finds on the ground in Cape Town today.

Some may argue that a compact city form assists to increase land prices (Bertaud, 2004: 8). However, appropriate intervention in the land market through densification and the alienation of public land to this end may assist to influence land prices in a manner that feasible development options for a range of incomes can be established and assist the integration of diverse sectors of society. The idea of

¹¹ The role of urban planning and design should not be underestimated in urban sustainability efforts. It is a vital component of the urban delivery process and important as a dynamic practice of “adaptation and sustainability” (Zetter & Watson, 2006: 5), particularly for the lives of the urban poor.

¹² See also *The New York Times* in *The Times* (Friday March 7, 2008). ‘Human Shadows Leave Haunting Portrait of World’s Seas’ by Andrew C. Revkin. This article reveals that the cumulative human impact (i.e. organic pollution from agricultural runoff and sewerage, damage from shipping, traditional fishing close to shore, construction destroying the effectiveness of continental shelves and so on) on the ocean around South Africa is a medium-high impact. About 40% of the global oceans are strongly affected by human impact, with only 4% pristine, but poised for change. However, the most widespread human impact is the drop of pH of surface waters as a portion of the billions of tons of CO₂ added to the atmosphere from fuel and forest burning each year is absorbed in water, where it forms carbonic acid.

¹³ Burdett & Sudjic (2007) identified that the Urban Age projects by the London School of Economics and Deutsche Bank’s Alfred Herrhausen Society, recognise urban connections between social, spatial and economic sectors within 6 global cities: New York, Shanghai, London, Mexico City, Johannesburg and Berlin.

multifaceted and dense compact neighbourhoods leads to the recognition of people's inherent energy; the possible convergence of different cultures, generations, languages and imagination – a soft but significant component of sustainability. The compact city moves towards achieving a positive integral and distinctive city where multiple components result in a *total living environment*. Such issues of the compact city may be investigated by understanding how appropriate densification might make cities better places to live (Power, 2007); accessible places where mobility is about choice and where there is an improved overall quality of life.

An overarching aspect towards creating the compact city is the important role of design. Design within the planning domain ensures that the urban environment performs from a programmatic perspective. In other words, the ingredients that comprise a functional urban environment such as health and education institutions, different housing types and forms of service provision, work and recreational opportunities are sufficient enough to serve a particular number of people or increase densities at the most appropriate locations. However, design in the planning realm has an even more important role to play to ensure that these ingredients relate to one another in such a way that they perform as a coordinated urban system. Design must focus on the nature of the void between these elements and in particular the interface which mediates between the public and private domains of the city. Holistic and appropriate design is particularly successful at the local neighbourhood scale where contextual issues can be understood in detail and the local community actively engaged in the design process (Mammon *et al.*, 2008).

Unfortunately, design is in many cases treated as an afterthought and perceived as a luxury in our context where resources are scarce and basic needs dire. Integrated design has a significant effect on the lives of urban dwellers, in particular the urban poor. Notwithstanding the above, the aspect of 'over-design' can end up destroying the democratic potential of our cities (Sennett, 2007). Consequently, we need to understand the limits of planning and design when reinforcing the compact city based on a systems approach that comprehensively redirects inputs and outputs to maximise their full potential. Critical to developing successful neighbourhoods is appropriate urban density (Davis, 2008), where the number of people is feasible to create local services and energy efficient systems with access to local parks, schools and public transport within walkable distances. However, such an approach only makes sense where there is strong governance and political will combined with active interaction and participation of the citizens.

The compact city presents a notion of Cape Town as a complex web of urban surfaces interlinking its core urban nodes with a network of urban corridors and hierarchy of places and spaces as a fundamental layer reinforcing both. Towards the outer periphery the surface reflects a zone of transition that comprises multiple green and urban layers that are edged by the rural and productive landscape, which are held by dominant mountain ranges on either side. These in turn, define the domain of the Indian and Atlantic oceans – an endless expanse defining the south-east and north-west edges of Cape Town.

Source: Jacqui Perrin



Inner city Cape Town

Source: NM & Associates



Housing on the urban edge

Source: NM & Associates



Rural/urban edge to Cape Town

Source: Kathryn Ewing



Mountain to sea Cape Town

To set Cape Town on a sustainable pathway, the following goals are key spatial ingredients towards a compact city:

- a) **The role of land and landscape.** A key goal in shaping urban form is to adopt a systems approach to planning and design where land is respected as a non-renewable resource and the inherent qualities of landscape are acknowledged.
- b) **Mobility and land use as an interrelated potential to sustain the city over time.** The goal in this instance is to reinforce an integrated land use and public transport approach, maintaining that mobility and land use cannot be dissociated if a sustainable urban environment is to be achieved.
- c) **Public Structure and sustainable infrastructure design.** The goal here is to create a positive urban environment comprised of multiple urban components including a network of public transport focused routes connecting a hierarchy of nodes, public spaces and integrated infrastructure design between the primary requirements of the natural landscape and those of settlement.
- d) **Built Form.** The goal is to work towards a total living environment in a walkable neighbourhood with a focus on mixed use development guided by holistic planning and urban design.

Table 1 unpacks these goals in terms of targets that can be set to achieve them. Three points must be made clear here:

- *Firstly*, while targets are much better understood when expressed in quantitative terms, for example, a renewable energy target of 15% by 2014; the planning and design of the compact city is as much about art and creativity as it is about science and quantum. In fact, one can argue that the latter approach has resulted in the fragmented Cape Town as we know it today;
- *Secondly*, the unsustainable nature of informal settlements is not directly addressed in the paper for lack of space and given the complex nature of such settlements. It must however, be borne in mind that much can be learnt from informal settlements in terms of compact city elements such as space making, layout planning, resource use¹⁴ and so on.¹⁵ At the same time they should not be romanticised as they do not present ideal living environments from the perspective of exposure to flooding, fire, unsanitary conditions, health risks etc. against which appropriate urban settlement making response must be investigated; and
- *Thirdly*, these goals are seen as the key spatial components of the overall framework. They are not the only goals however, and they are not in isolation from one another. Furthermore, the paper emphasises the public realm aspects of city making relative to density and urban form.

¹⁴ The poor are much more resourceful in terms of using recycling materials albeit sometimes out of desperation (Simmonds & Mammon, 1996).

¹⁵ It is important to point out that the ecological footprint of people living in informal settlements as far as water and energy consumption is concerned, is relatively low and arguably fulfils some sustainable criteria (Swilling, 2006: 39).

Table 1: Achievable Targets and Practical Responses

TARGETS

EXPLANATORY NOTES

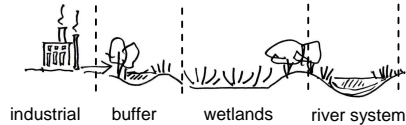
a) LAND AND LANDSCAPE

- | | |
|--|--|
| <p>1. Set limits to urban development</p> | <ul style="list-style-type: none"> ▪ Ecological and environmental constraints must inform urban development. |
| <p>2. Conservation of land and sea as non – renewable resources</p> | <ul style="list-style-type: none"> ▪ Protect natural landscape against indiscriminate development and industrial/human waste. ▪ Fix opportunities for productive land within the urban domain e.g. 3ha urban agriculture productive land unit with basic accommodation (refer to SANRIF, 2008; also see Maas <i>et al.</i>, 1998). ▪ Densification and public investment in areas around nodes, corridors and high threshold points in the city (refer to CoCT, 2008 for densification strategies and tools). |
| <p>3. Establish transition zones to protect valuable assets including biodiversity</p> | <ul style="list-style-type: none"> ▪ Protected edges: Identification of sensitive natural areas within the development areas and along the declared biosphere reserves ▪ Productive edges: Positive use of transitional land which historically remained vacant ▪ Developed edges: Layer the public realm to create transitions between public and private domains. |

DIAGRAMS/ILLUSTRATIONS/EXAMPLES



LIMIT TO URBAN DEVELOPMENT ON EDGE CT



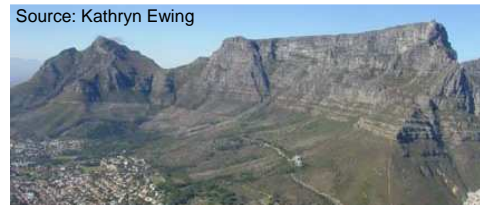
TRANSITION FROM INDUSTRIAL TO NATURAL SYSTEMS



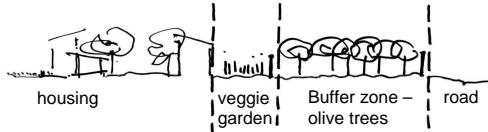
AGRICULTURAL LANDSCAPE ON EDGE OF CT



DENSE SETTLEMENT AT NOLUNGILE STATION, CT



PROTECTED NATURE RESERVE OF TABLE MOUNTAIN



BOUNDARIES/THRESHOLD TO ROAD RESERVE CONDITIONS



LAYERING OF BELHAR HOUSING AND PUBLIC SPACE, CT

- 4. Make public land play a positive redistributive role
 - A redistributive role can be achieved through value capture which is an instrument that government can use to intervene in the land market, relying on land taxation, levies or planning instruments (see Brown-Luthango, 2006; & Gihring Thomas, 1999).

b) TRANSPORT AND LAND USE

- 5. Move to 80/20 public/private transport modal split
 - The greater the use of clean forms of efficient and affordable public transport (PT) the more likely the reduction in CO₂ emissions, which could be linked to carbon credits.



Source: NM & Associates
 VALUABLE LAND SURROUNDING KHAYELITSHA STATION



Source: Kathryn Ewing
 BUS LANES IN PEREIRA, COLOMBIA

- The greater use of PT encourages greater movement on foot and other modes of non-motorised transport (NMT) e.g. bicycles, horse and cart.

1. 350-500m walking distance to crèche, bus station, school, play park, local store
2. 1-2km walk to PT stations, secondary schools, shops
3. 2-5km travel by NMT (cycle) to PT corridor
4. 8-10km cycle/PT (feeder service) to major PT transfer facility, institution, workplaces and travel by horse and cart

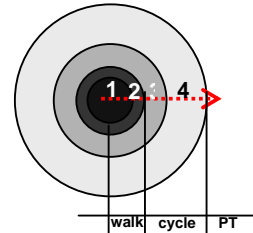


DIAGRAM TO SHOW NMT & PT SERVICES IN DISTANCES

- Investment in PT infrastructure together with the development of land and other public infrastructure i.e. bus stops and stations, bicycle storage etc. results in greater opportunities for and improvements in economic growth and development (see Mammon *et al.*, 2008)



Source: Kathryn Ewing
 PT INFRASTRUCTURE IN PEREIRA, COLOMBIA

- 6. Achieve sustainable urban mobility
 - Create incentives and programmes for appropriate marketing, awareness and education on the value of energy savings e.g. in Curitiba tokens for recycling enabled free PT trips for participants

- Develop car-free weekend and public holidays and encourage safe cycling to education facilities.



Source: Kathryn Ewing
 CAR FREE SUNDAY IN BOGOTÁ, COLOMBIA

- 7. Develop mixed land use opportunities along with densification to increase dwelling units/ha as defined by context and guided by the CoCT Densification Strategy (2008).
 - Targeting areas that are within walking distance of PT corridors and developed urban centres.
 - Tools for existing infill opportunities in built up areas include creating overlay zones, integrated and performance based zoning and others (see CoCT, 2008).
 - Attempt to achieve an urban gross base density of 25 du's/ha across Cape Town by 2030.



Source: Kathryn Ewing
 MIXED-USE & PT CORRIDOR IN BOGOTÁ, COLOMBIA

c) PUBLIC STRUCTURE AND SUSTAINABLE INFRASTRUCTURE

- 8. Protecting public assets and places that encompass the significant roles of culture, memorialisation, heritage and celebration
 - Recognising the role of 'soft' aspects of sustainability through the celebration of public culture, history and memory.

- 9. Restructure the spatial environment through reclamation of public spaces for public purposes
 - Acknowledging the role of public elements in structuring urban space.
 - For example, reclaiming street space for people rather than private vehicles.

- 10. All investment in public places and spaces that form a cluster of facilities that service neighbourhoods
 - Public expenditure should make adequate provision for investment in public structure and institutional buildings and not rely on the sale of public assets (e.g. land) to cross-subsidise such public investment.

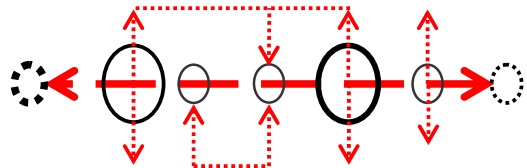
- 11. Maintain intrinsic natural systems in the landscape
 - Hard and soft infrastructure design to respond appropriately to natural flows of systems for example, storm water management could be a lot more appropriate and less expensive when natural flows are undisturbed and carefully treated in settlement making.

- 12. Promote resource use conscious society
 - Incentives and public/professional education programmes with respect to natural and built environment relationship.

- 13. Encourage practices that minimize the use of energy for constructing and maintaining urban settlements
 - Adaptation of existing public buildings and infrastructure.
 - Using and maintaining green technology in new urban settlement with emphasis on local materials and local labour.
 - Encourage and reinforce guidelines and practices promoted by the Green Building Council of South Africa (GBCSA)



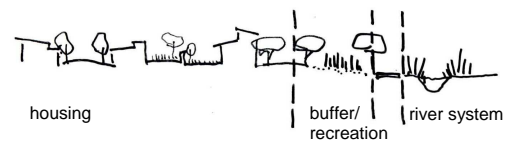
Source: Paterson and Mammon
 GUGULETHU SEVEN MEMORIAL IN NYANGA, CT



IDEA OF NODES ALONG A CORRIDOR IN RESTRUCTURING



Source: Jacqui Perrin
 PHILIPPI INTERCHANGE AND TRADING FACILITIES, CT



TRANSITION LAYER FROM URBAN TO RIVER SYSTEM



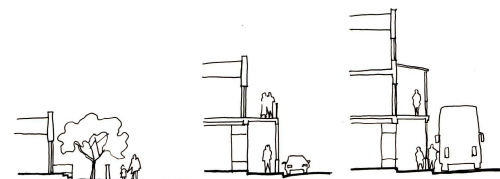
Source: Kathryn Ewing
 RECYCLING BINS IN GUAYAQUIL, ECUADOR



Source: Kathryn Ewing
 BEDZED 'GREEN' URBAN SETTLEMENT, LONDON

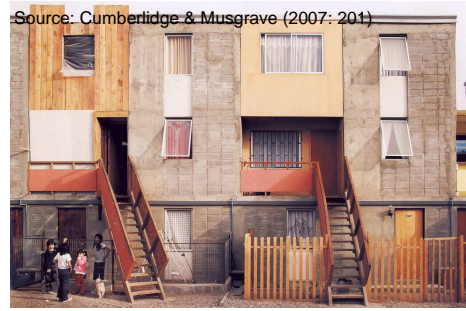
d) BUILT FORM

- 14. Promote and protect human scale urban places and spaces
 - Transitional spaces should always exist between private and public areas i.e. stoep, small garden or change in level/ground floor plane.

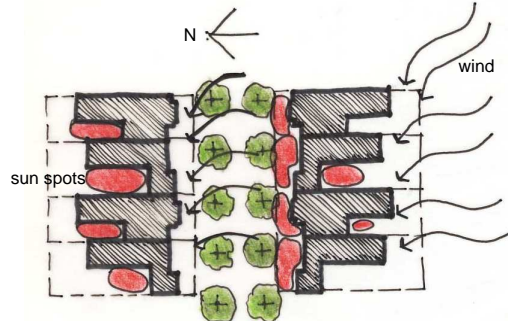


PUBLIC/PRIVATE TRANSITION OF BUILDING TO STREET

- Ensure street frontages are lively and animated by encouraging narrow housing/apartment/row housing e.g. with a traditional 6m width for a row house to achieve this condition.
- Ensure activated streets by perimeter block development where setbacks from the street should be no more than 2m for double storey and 3m for more than 2 storeys.
- Orientation – wind tunnels are to be avoided (particularly in Cape Town) and all housing is to have access to natural sunlight for at least half of the day. All public spaces (streets, squares and parks) to have access to sunlight for most of the day.
- All habitable rooms are to have adequate natural ventilation.
- Vertical and horizontal circulation to be of adequate size with natural light.
- All habitable rooms are to be of liveable sizes, where bedrooms are no less than 9m² and 12m² for a double bedroom. Comfortable habitable unit size 5 person households to be no less than 72m² per dwelling unit (Neufert, 1980).
- All housing should have access to balconies and/or outdoor spaces.



Source: Cumberland & Musgrave (2007: 201)
 QUINTA MONROY HOUSING PROJECT, CHILE

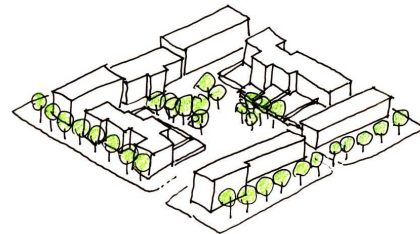


(Adapted from District 6 Architectural Guidelines by Le Grange Architects and urban Planners and NM & Associates)

PLAN TO SHOW SUNLIGHT & WIND – ROW HOUSING

15. Restructure the urban block to promote walkability and NMT, ease of circulation on foot, densification and access

- Densify to concentrate urban settlement and minimise use of infrastructure investment and need for use of private motorised transport.



SKETCH TO SHOW PERIMETER BLOCK HOUSING

16. Design green buildings that minimize the use of energy

- Green Building Guidelines become compulsory in all new buildings and green by-laws are actively driven by local government.
- Installation of water storage, solar panel heating, appropriate insulation and green building elements to existing buildings.
- Generate involvement of communities in driving “green technologies”. For example encourage community group participation in building a straw bale community centre setting precedent whilst generating active engagement and identity in neighbourhoods, such as the Hopi Nation Elder Home in Hoteevilla, Arizona, USA (see Architecture for Humanity, 2008: 150-153).
- Encourage increased planting and maintenance of street trees and enhance public parks with tree planting programmes.



Source: Architecture for Humanity (2006: 152)
 STRAW BALE HOPI NATION ELDER HOME, USA

4. Conclusion

There is no doubt that current attempts at densification only marginally improve sustainability given the limitations of Cape Town's urban form. This paper promotes the compact city as a planning and design approach to making sustainable urban environments. The focus of this approach is on:

- Land and landscape playing a key role in respecting the inherent qualities of land as a non-renewable resource;
- Interrelated aspects between mobility and land use;
- Public transport focused routes connecting a hierarchy of nodes, corridors and public spaces;
- Integrated design of infrastructure that recognises the primary requirements of the natural landscape as well as settlement; and
- A total living environment in neighbourhood planning and design.

The targets presented in Table 1 provide a basis for further exploration of the compact city and appropriate research towards setting Cape Town on a sustainable pathway.

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