Cape Town 2025: A City of Sustainable Neighbourhoods[1]

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Introduction

This paper is less about Cape Town and more about Capetonians. To this extent it differs from approaches that refer to the city as an object to be acted upon by policies and plans to achieve specific objectives, such as 'housing *for* the poor'. It also differs substantially from mainstream discipline-specific approaches such as urban economics or ecological conservation. Instead lifestyles, the urban system and eco-system services are seen as interconnected non-linear complex systems that are embedded within each other in ways that are rendered inexplicable by the traditional split between natural and social science knowledge systems. Using a complexity approach, it reflects on the inter-relationships between three dynamic flows:

- Capetonian *households*, expressed most clearly in the location, property values and consumption patterns of households. In particular where Capetonians live out their lives; what they do; what they consume, read and see; and in particular what they require from the urban system to live the way that they do, or what they require to live in the way they would like to live. In short, their *lifestyles* are the mix of behaviours, activities, habits, living arrangements, consumption patterns, consumer values, choices and aspirations that define Capetonian households within their complex and varied financial, physical and social contexts.[2]
- the *urban infrastructure* which provides the holding spaces for these households and associated lifestyles, specifically the services that Capetonians require to live out their daily lives – the water, sewerage, energy, refuse removal, transportation, land, shelter, data and food supplies that they take for granted. Behind these urban systems lie the policy makers, planners, managers and operators who keep the systems going. They collect the various levies and service charges that make up the City Budget that finances the provision of many of these services. But they have to do this within a framework of policies, plans and procedures that reflect the way they – and their predecessors - have imagined the system should and could work.
- the *eco-system services* at the local and non-local levels that households take for granted and which the urban system requires in order to provide the holding space for daily urban

[1] This paper was prepared as an input paper for the project 'Cape Town 2025', an initiative of Isandla Institute in partnership with the City of Cape Town. The project took place in 2005.

[2] Lifestyles are not synonymous with culture – culture embraces lifestyle and goes beyond lifestyle because it also includes identity, meaning and discursive reference points unrelated to context. Lifestyle is more economistic and consumerist, and less about identity and meaning.

life, with special reference to water, energy (in particular oil), soils and land, food, clean air and waste.

The analysis will be framed by three normative concepts that are impossible to fully quantify, namely equity, integration and sustainability. Equity means significantly reducing the inequalities that exist between classes, which are to a large extent expressed in the city in spatial terms. A precondition for this is the provision of the urban infrastructure (including housing) that many poor communities lack. Integration inevitably means both densification and a social mix across race and class boundaries. Sustainability means making sure that every citizen has sufficient to live a decent quality of life without consuming more than his/her fair share of the eco-system services that are required by this and future generations to live a similar or better quality of life.

The analysis rests on the conceptual proposition that households depend on the quality of urban infrastructures provided by the City; urban infrastructures, in turn, are rooted in economies (in particular tax bases); and all these systems are embedded in eco-systems. A vast range of energies and resources flows through these systems in ways that have differential and often unpredictable effects at different levels. Households, however, are our focus and, in particular, how different ways of configuring urban infrastructures can impact on households. Local Government has the capacity (via land-use, investment and service delivery) to influence the way urban infrastructures evolve in ways that result in different outcomes for households, i.e. either more or less equity, more or less integration and more or less sustainability. These continuums are non-corresponding: more equity could well mean less sustainability; more integration could entail racial equity within the middle class without integration across classes; and more sustainability might require more cross-class integration. Furthermore, a given suburb might be ecologically sustainable from a narrow green perspective, but socially unviable because the majority of households may lack basic services. Equity, integration and sustainability are only trade offs if the definition of the techno-infrastructure remains constant – change these specifications, and resource flows through the system change thus opening up the way for a re-alignment of the issues these three principles relate to.

Our primary proposition is as follows: the contemporary modern urban system (namely the spatial layout/form, function, economy, tax base and operational requirements) can be defined as the ‘consumption city’ model. It needs to be replaced by a ‘sustainable city’ model that decouples improving living standards from rising (and increasingly unsustainable) resource consumption.

The ‘consumption city’ model (this term was inspired by the book by Low, et. al, 2000) was driven by the economic realities of the c.20th city: namely, the need within capitalist economies to create a mass of consumers that provide the markets for the suppliers of the basket of urban goods that are now defined as the basic elements of urban living - houses, vehicles, energy, food, leisure, household appliances and fittings. When General Motors and Standard Oil bought up the trams in US cities in order to close them down while they promoted highway construction, their aim was to sell more cars and oil, not build the ‘good city’ (see Heinberg, 2003) . The basic building block of the ‘consumption city’ is the

'consuming neighbourhood' that, in particular, needs to buy in the necessities for daily living from the outside (often from very distant locales) – energy, water, waste removal services, building materials, food, vehicles, etc. The city's urban infrastructures had to be planned and managed to make sure these goods and services can be supplied, transported, removed, financed, and extended.

The 'sustainable city model' is a response to equally powerful c.21st needs: the rising cost of eco-system services and fossil fuel supplies that the 'consumption city' has hitherto taken for granted. (And this at precisely the moment when the global population makes that historic transition to being majority urbanised (see Hardoy, et. al., 2001.) The basic building block of the sustainable city is the 'sustainable neighbourhood', namely the neighbourhood that generates more energy than it consumes, generates zero waste (both liquid and solid), meets most of it's basic food requirements from local sources, requires little or no fossil fuels to transport people, and releases minimal amounts of CO2 into the atmosphere. The 'sustainable neighbourhood' helps to rebuild eco-systems and mitigates the risks associated with the rising costs of fossil fuels as these non-renewable resources run out. As such, the 'sustainable neighbourhood' is also economically more efficient because in theory the 'sustainable neighbourhood' should be able to pay lower rates and taxes because it makes less demands on externally provided services, thus making it a more attractive operational space for households and businesses (some examples of this rapidly growing literature include(see in particular the various contributions in Satterthwaite, 2001; also Pugh, 1996, 1999; Girardet, 1996; Godschalk, 2004; Mitlin & Satterthwaite, 2004; Roelofs, 1996; Beatly, 2000; Wheeler & Beatley, 2004; Portney, 2003; Girardet, 2004; Keiner, et. al., 2004; Swilling, 2005; and the largest collection of papers ever brought together on the subject in an e-conference at http://www.ias.unu.edu/proceedings/icibs/ecocity03).

In reality, the 'consuming neighbourhood' and the 'sustainable neighbourhood' are not mutually exclusive options; they are extreme points on a continuum. For our purposes, the equity, integration and sustainability criteria will be used to assess the future options discussed below.

In our view, cities as such don't change. It is neighbourhoods that change. City change is an emergent property[3], not a determining factor. The transition from the 'consuming neighbourhood' to the 'sustainable neighbourhood' is a story that is emerging across many cities across the developed and developing world, and what is remarkable is that this story tends to reflect a standard repertoire no matter where it emerges.[4] (Quite optimistic that there is indeed evidence of a 'transition'). These common features are as follows:[5]

[3] This concept is derived from complexity theory which explains a particular phenomenon not via reduction to a particular cause, but by taking into account a wide range of patterned non-linear dynamics whose exact outcomes are not predictable but lie within a given range of probabilities.

[4] The references to the 'sustainable cities' literature cited earlier in the article substantiate this claim. However, two major international conferences have taken place in 2005 that provide incontrovertible substantiation for this claim, namely the Sustainable Building 2005 Conference in Tokyo in October 2005 [see www.sbo5.com] and the International Platform on Sustainable Urban Development in Geneva also in October 2005 [www.geneva-palexpo.ch].

[5] These principles are derived from a merger of two similar lists, namely in Swilling, M. "Rethinking…..", op. cit., and from the One Planet Living Programme which is a joint initiative for planning and building sustainable neighbourhoods between World Wildlife Fund and a UK-based consulting firm called Bioregional (see www.bioregional.com).

- transition to renewable energy alternatives and energy efficiency
- zero waste via re-use of all waste outputs as productive inputs
- sustainable transport, with a major focus on public transport
- sustainable construction materials and building methods
- local and sustainable food (especially organic food)
- sustainable water use and re-use of treated sewerage
- enhancing biodiversity and the preservation of natural habitats
- valuing authentic cultural diversity and a sense of community via a participatory culture
- equity and fair trade at all levels (global, regional and local)
- health, well-being and soulfulness

If consumerism was the metaphor that laid the cultural foundation for what is recognised now as a dysfunctional urban modernism, the above set of principles for sustainable resource use are emerging as the cultural foundation for a more functional vision of urban sustainability.

Futures

It is possible to imagine four possible future perspectives when the three themes of equity, integration and sustainability are used as a lens for shaping and contextualising this act of imagination. They are as follows:

- *Business as usual*: basically a continuation of the status quo into the future, with projections about the consequences of limited change. The consequences are increasing inequalities and deepening poverty; race and class divisions will get worse within a context of state subsidized urban sprawl; and highly inefficient urban systems will persist causing eco-system services to further degrade, rapidly rising costs of energy (in particular oil), water, refuse removal, transport, food and shelter which, in turn, will exacerbate inequalities reinforced by spatial dis-integration. Ultimately this will lead to a general state of decline represented most graphically by the continued expansion of gated communities on the one hand and sprawling informal settlements on the other, with corresponding totally disconnected lifestyles. Sustainability gets captured by a conservationist lobby with a narrow focus on 'saving the fynbos and the Mountain' – they succeed, because this becomes the therapy Capetonians require to survive the psycho-social mess that will result from the business as usual scenario. In this scenario, factory closures continue and unemployment escalates. Hopelessness sets in in poor communities as the possibility of change disappears entirely from the collective consciousness of all who live in poverty, except a few increasingly marginalised activists. Violent crime becomes an endemic feature of everyday life and the anti-hero is worshipped by the youth.

- *Developmental state option**:*** in this scenario, Provincial Government and the City manage to agree on a package of developmental interventions in the land market in particular in order to achieve greater integration and equity, with at best a rhetorical commitment to sustainability (and some flourishes here and there, such as solar water heaters for poor households – a merely symbolic gesture because these households use

minimal quantities of energy compared to middle class households [Sustainable Energy Africa, 2003] - reference). Taking advantage of Central Government commitments to infrastructure investment within the framework of the National Spatial Development Perspective (NSDP), publicly owned inner city land is secured for socially mixed integrated developments that result in densification, new local economies, and the promotion of a kind of 'melting pot' lifestyle that draws historic reference points from District Six and contemporary reference points from currently mixed areas such as Woodstock, the 'African Renaissance' and the icons of popular music culture. The V&A Waterfront, Loop Street, the beaches and the expanding Malls come to symbolise the successful expansion of state-driven extensions of consumption as the middle class expands and changes colour. Infrastructure funds get spent on expensive sewers rather than much cheaper biogas digesters, public transport is expanded but remains dependent on fossil fuels, the middle class is allowed to build energy inefficient houses that are not forced to separate wastes, and nothing is done to promote local food markets. Unfortunately, the ignored eco-system thresholds come home to roost: the wrong assumptions about cheap water, oil, energy, waste management, sewerage treatment, food and eco-tourism dollars undermine growth and therefore the resources for poverty eradication and ultimately integration as the rich buy their way out of unsustainability by reversing integration. Islands of eco-efficiency do emerge, but the continuation of public subsidies of eco-inefficiencies (that the emerging black middle class require to sustain their middle class spatial locations) undercut the resources required to fully realise the poverty eradication aims of the developmental state option. In this scenario, the textile manufacturers remain open for a while as public funds reduce costs in certain circuits (e.g. transportation, port fees, energy discounts for certain employers), but ultimately they close down.

- *Sustainability option**:*** in this scenario, Provincial, City and National Government realise early on that sustainability – or more precisely, *sustainable resource use* - provides the *means* to achieve equity and integration because a sustainability approach releases large quantities of funds that would otherwise be spent on the subsidization of ecologically inefficient urban systems. A key turning point being the Summit on Sustainable Development in June 2005. Massive savings are generated from investments in smart infrastructures designed by engineers and financial experts who are briefed to learn from thousands of working models found locally and elsewhere in the world where poverty eradication has been achieved via sustainable resource use strategies. The available funding for urban infrastructure is thus used to trigger the sustainability option instead of it being allowed to fund 'business as usual' options by risk averse engineers who have failed to convince everyone that 'tried and tested' designs are the least risky. More equity is achieved not by fundamentally altering middle class lifestyles, but by removing the subsidies and reducing the costs of this lifestyle via restructuring the techno-infrastructure that supports it (e.g. by changing the bye-laws that govern the approval of building plans) and by the creation of an entirely new 'green economy' driven by a new generation of "GEEs" – "Green Economic Empowerment" entrepreneurs with massive investments in hydrogen-mediated energy, windfarms, the solar power sector, carbon trading, new inner city eco-designed office blocks, sustainable mari-culture businesses, organic farming and

the fastest growing sectors of all, namely sustainable construction, recycling, public transportation and authentic eco-tourism. (Indeed, cheapening the cost of middle class life by decoupling lifestyle from resource consumption lowers the barriers for entry with significant social and political benefits on the integration front.) Integration is achieved via densification and the use of public land to build numerous socially mixed and mixed use areas that are designed to reduce distance between home and work and increase use of public transport by the middle class. Sustainability is achieved via interventions that transform all liquid and solid wastes into productive inputs into the urban system (e.g. via biogas digesters, waste separation at source, etc), reducing total consumption of water while increasing access to more free water for all, flooding the market with subsidized compact fluorescent lighting coupled to supermarket agreements not to stock incandescents, and massive state regulatory and financial investments in local food markets that make it possible for local farmers to sell direct to the public thus creating cheaper healthier food for all coupled to financially viable business-driven land reform in a band surrounding the city – farms which also get free fertilizer from the nutrients captured from organic liquid wastes. Indeed, it is these open air food markets that emerge across the city that reflect the new 'melting pot' lifestyle that the sustainability option makes possible – places where rich and poor mix, where rural meets urban, where entrepreneurs flourish, where new cultural expressions find free public audiences, and where social capital is built. In this scenario, the textile manufacturers remain open and expand into a new eco-efficient factory buildings with massively reduced operating costs, and production of garments get sub-contracted to a network of neighbourhood-based fully unionised skilled garment makers (some of whom also have stalls at the open air markets).

- *Deep Green option:* in this scenario, sustainability becomes an end in itself as the 'green lobby' manages to trigger a groundswell of value and cultural change that results in a demand for sustainable communities across the city. Instead of using sustainability as a means to achieve sufficiency and integration via the notion of *sustainable resource use, sustainable living* becomes the overriding focus in ways that may result in integration via densification, but not necessarily across racial boundaries because race will not be seen as such a problem. Many of the strategies referred to in the sustainability option will be pursued, but much greater emphasis will be placed on conserving green spaces (possibly resulting in lower densities overall), the Mountain, saving the fynbos; and eco-tourism and organic farming will be the preferred economic drivers. Because this option requires a kind of conversion to a new value system and culture, it will probably require a crisis of significant proportions to trigger the necessary sea change. It is, therefore, most likely to happen later after a 'business as usual' scenario has been allowed to run it's course ending in a severe crisis in ten or fifteen years time. In the meantime, 'eco-villages' will emerge in pockets where key technical and financial innovations will be tested, but without much state support. If for some reason Government tries to impose a 'deep green' option, it could exacerbate existing tensions between a 'first resolve poverty then worry about the environment' position, and the 'green conservation' lobby that is perceived to be more interested in saving the environment than eradicating poverty. .

Although the above four perspectives are useful for thinking the future, in practice it is the 'developmental state' and 'sustainable development' options that are most pertinent. The 'business as usual' and 'developmental state' options assume the long-term viability of the 'consumption city' paradigm, while the 'sustainable development' and 'deep green' options assume a 'sustainable city' paradigm. The rest of this paper, however, will not consider all these permutations but will be limited to a discussion of the 'developmental state' strategy to extend the benefits of the 'consumption city' paradigm to the majority of Capetonians, and the 'sustainable development' strategy to put in place the foundations for a 'sustainable city' via the fostering of sustainable resource use to build 'sustainable neighbourhoods'.

Global Context and Footprinting

Viewed from the perspective of the global south, the future will be determined by a remarkable patterning of forces and events that have hitherto escaped the attention of analysts who remain confined to their respective disciplinary barracks. It is no longer possible to think about the economic growth of developing economies within a globalised economy without taking into account the effects of the 'oil peak' on oil prices and how rising oil prices will blow holes in oil dependent economies. Nor is it possible to think about eradicating poverty in developing countries without taking into account the results of the UN's Millennium Ecosystem Assessment (MEA). The linkage between climate change and human activity is now an uncontested fact, but has enough been said about its impact on food supplies? And what about the relationship between population growth and the transition to a majority urban world, and how this will be affected by the oil peak, climate change and eco-system degradation?

Consider the following patterns:

Peak Oil

Just when a remarkably high number of developing economies are starting to grow consistently, and just at the point when Africa is starting to get it's act together to emulate Western economic growth strategies (see Aryeetey et. al., 2003), the key condition that made it possible to grow the developed economies over the past 100 years is about to fall away, namely cheap oil (Heinberg, 2003).

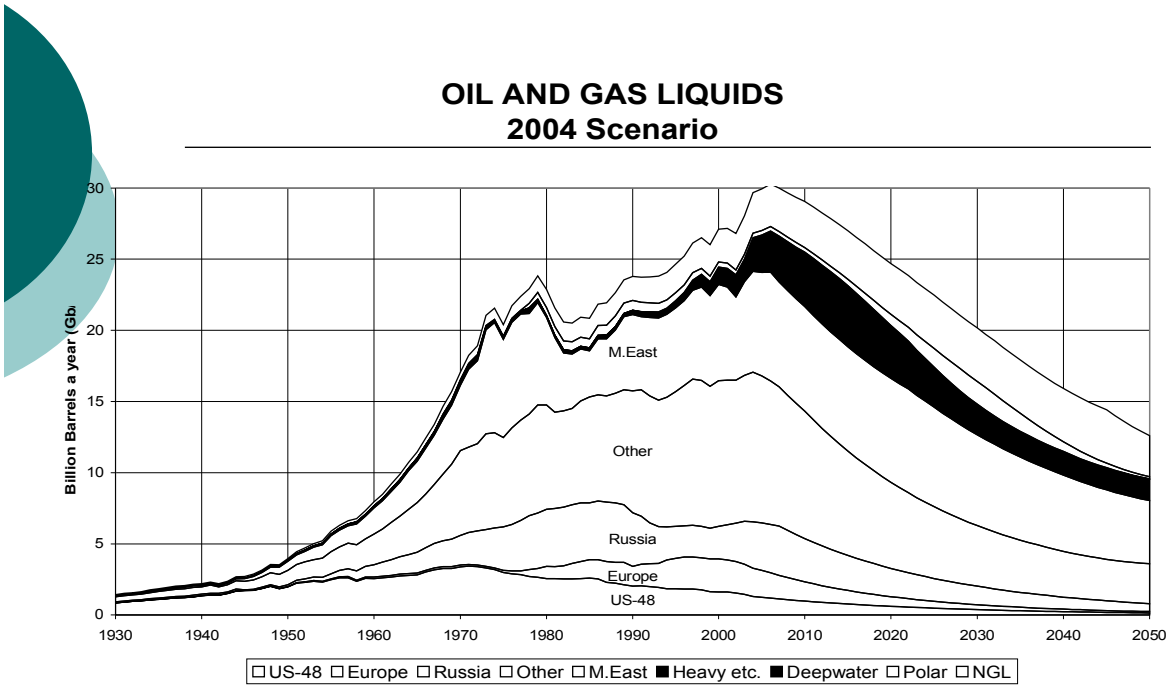


Table 1: Oil and Gas Production, 1930-2050. *Source: www.peakoil.net*

Table 1 from the respected UK-based Oil Depletion Analysis Centre is a scenario which is based on the fact that "[w]e have produced almost half what is there, and we have found about 90%. We consume 22 Gb [giga barrels] a year but find only 6 Gb. That is to say, we find one barrel for every four we consume from our inheritance of past discovery." (http://greatchange.org/ov-campbell,outlook.htmlFeb 2002) The result is that we have probably hit peak oil production in 2005 at precisely the moment when demand looks set to grow at unprecedented levels in emerging economies (Tsalik & Schiffrin, 2005).. The result, as the Table 2 reveals, is the 'oil gap'.

Table 2: The Oil Gap. Source: www.peakoil.net

This is what lies behind the inexorable rise in the oil price as illustrated in the table below:

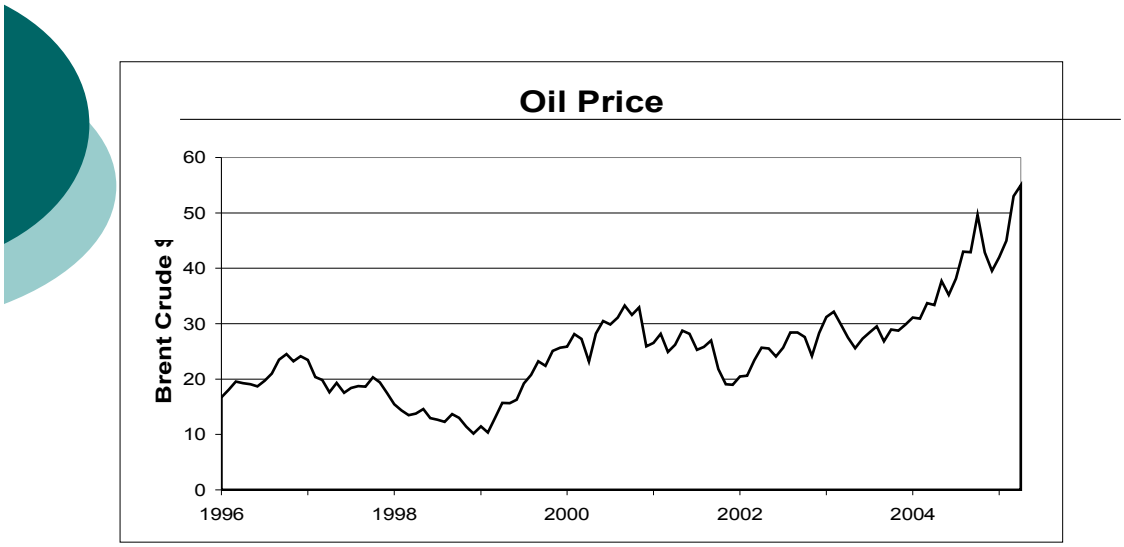


Table 3: Oil Price Rises. Source: www.peakoil.net

By September, the oil price finally went over the unprecedented $60 pB mark. There might be rises and falls over the next few years, but the general overall trend is up (see Table 3). The South African Reserve Bank, Minister of Finance and the Industrial Development Corporation have all acknowledged that growth will be constrained by oil price increases because the oil price substantially undercuts hard won economic gains made by businesses and households (see "Manuel Budgets for Oil Above $60", Business Report, 22 September, 2005). For cities like Cape Town, where 56% of all energy is derived from oil (Sustainable Energy Africa, 2003), it will become increasingly obvious that to remain an attractive location for businesses it will be necessary to reduce dependence on oil in order to insulate transaction costs from rising oil prices.

Degradation of Ecosystem Services:
In 2005, the United Nations released the *Millennium Ecosystem Assessment* (www.millenniumassessment.org). Compiled by 1360 experts from 95 countries, this remarkable set of reports found that 60% (15 out of 24) of the ecosystems examined are being irreversibly degraded or used unsustainably, including the provision of fresh water, capture fisheries, air and water purification, and the regulation of regional and local climates, natural hazards and pests. The report found that the costs of this unsustainable resource use are rising, but get displaced from one group to another (in particular the poor) and to future generations. This remarkable report is the first major global study that confirms what many have suspected for decades, namely that as a species we humans are undermining the ecosystems we depend on for our survival. As the biodiversity of soils, rivers, seas, forests and other natural resource providers collapses with climate change, logging and urbanisation, many poor communities lose their sources of livelihood thus paying the price for ecosystem impacts that they are not directly responsible for. The poor in developing countries are paying the price for the actions of others, and in response many are forced to move into the cities.

Risks to Food Supplies:

The impact of human activity on climate change is now undisputed. The table below illustrates the now well known fact that the last few years have been the hottest in recorded contemporary history:

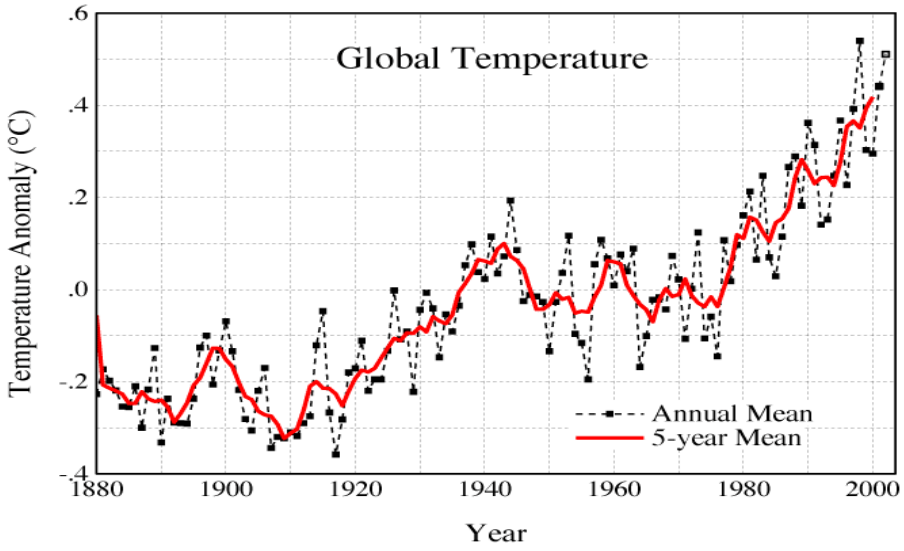


Table 4: Global Temperatures, 1880-2000. Source: www.ipc.ch

What is less known is that the construction and operation of buildings accounts for 50% of all CO2 emissions (Van Der Ryn & Cowan, 1996). This simple fact establishes the critically important link between cities and climate change. However, this is not true for all cities. Most cities in Africa, for example, are populated with structures that have very low CO2 emissions (Hardoy, et. al., 2001). Furthermore, of the 6 billion people who live on the planet, it has been estimated that 5 billion live in unfired clay structures of various kinds, from adobe, to cob, to wattle-and-daub – structures which have a negligible Co2 impact (Kennedy, 2001).

However, climate change and ecosystem degradation are combining in ways that undermine the security of global food supplies with direct and drastic implications for urban households, in particular poor urban households. Most of the world's food is produced by the 400 million small farmers who are generally more productive per hectare than large commercial farmers (Madeley, 2002). However, around 40% depend on the use of chemical inputs derived from oil (Ibid). As the oil price rises, weather patterns change and ecosystems further degrade, key conditions for food security fall away. In particular, soil degradation as a result of erosion, nutrient loading, salination and over-use of chemical inputs is drastically affecting agricultural production. The conservative Washington-based World Resources Institute estimated in 2004 that annual global agricultural production is worth $1,3 trillion, whereas 65% of agricultural soils show signs of degradation (i.e. reduced biological capability to produce food at the same rates) (www.wri.org/pubs). The key exceptions to this trend are where farmers have converted to organic production resulting in increased yields, reduced soil degradation and better economic livelihoods. Some of the most dramatic evidence for this comes from Maharashtra State in India as well as peri-urban areas in Central, Eastern and Western Africa (Mazzucato and Niemeijer 2000).

Population Growth and Urbanisation:
As population growth shoots through the 6 billion mark and levels off at about 9 billion by 2050 (www.census.gov/prod/www/abs/popula.html), the key question is where are the most significant population expansions going to take place. The answer is Asia and Africa, although to densities that may be less than those that pertain in areas with the highest population densities, namely parts of Europe (e.g. the Netherlands and England). However, we also know that populations in Asia and Africa are rapidly urbanising (Hardoy et. al., 2001). The result is that the bulk of the next 3 billion who must survive on the planet are most likely to be found in Asian and African cities. If these cities are not fundamentally re-organised in accordance with sustainability principles, oil price increases, ecosystem degradation and climate change will conspire to undermine all the best laid urban plans and economic strategies to make them potential generators of sustainable livelihoods over the long term.

Footprinting:
Besides the well known figures about global poverty and inequality (1,3 billion people in poverty, the incomes of the richest 25 million US citizens equals the income of 2 billion of the world's poorest people) , a sustainability perspective on the global context will also take into account the distribution of consumption of natural resource flows. The most frequently quoted statistics from UN Reports refer to the consumption levels of the global middle class which makes up 20% of the world's population (located mainly in North America, Europe, and Japan, plus islands scattered across the major cities of the developing and Arab world). This global middle class consumes 70-80% of the world's resources, including 45% of all meat and fish, 65% of all electricity, 84% of all paper, and 87% of all automobiles. The average annual consumption per person of fuels, minerals and metals in the mid-1990s was as follows: Japanese – 45 tons, Germans – 80 tons, Americans – 82 tons, Chinese – 34 tons. Worldwide CO2 emissions over the period 1990-2000 increased by 9%, double this in the US, but declining in OECD countries by 11% for the same period (See Sachs 2002).

This perspective on the unequal access to natural resources has been systematized in the "ecological footprint" approach (Wackernagel and Rees 1996) which reduces the total quantity of materials, food, energy, water and so on consumed by a country to a land area equivalent in order to arrive at a notional "fair share" of the earth's resources. Unsurprisingly, this generates the notion that as the world's population has increased, people have used more and more of the earth's natural resources, i.e. the amount of productive land available per capita has gone down. However, during this same period of time, the inequalities between rich and poor have become extreme. The end result is the following classic image from Wackernagel and Rees (1996):

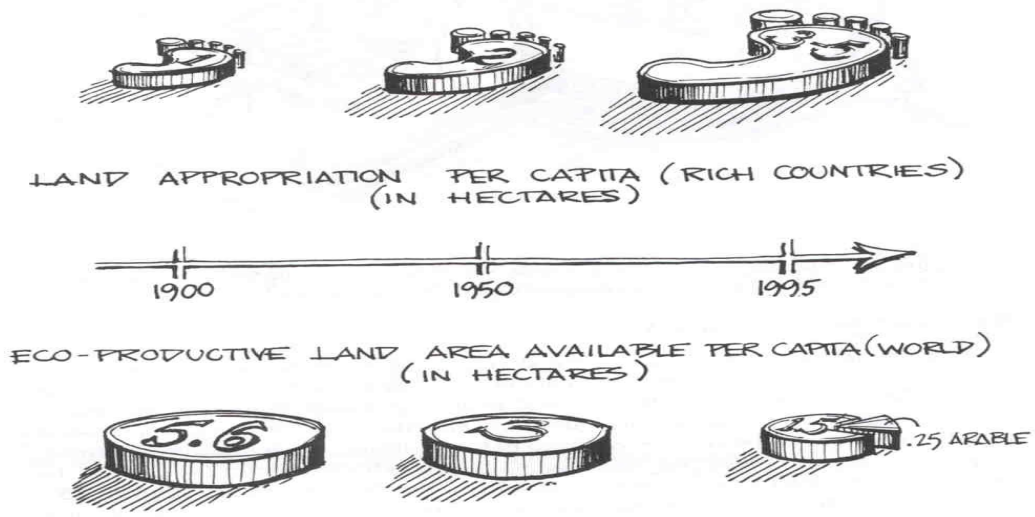


Figure 1.5: Our Ecological Footprints Keep Growing While Our per capita "Earth-shares" Continue to Shrink. Since the beginning of this century, the available ecologically productive land has decreased from over five hectares to less than 1.5 hectares per person in 1995. At the same time, the average North American's Foot-print has grown to over 4 hectares. These opposing trends are in fundamental conflict: the ecological demands of average citizens in rich countries exceed *per capita* supply by a factor of three. This means that the Earth could not support even today's population of 5.8 billion sustainably at North American material standards.

The implications are clear: the global middle class uses up more than it's fair share of resources and as a consequence, the global poor are forced to live off less and less. This approach pushes the argument further by suggesting that the amount of natural resources and eco-services consumed exceeds the planet's capacity to generate these resources and services by at least one third. This is what gives rise to the generally accepted estimate that if everyone was to live like a middle class American, at least three and possibly five additional planets will be required (Sachs, 2002).

Numerous cities around the world have used the footprinting methodology to generate 'sustainable city' and 'sustainable neighbourhood' strategies (Beatley 2000; Portney 2003). The reason for this is that the approach makes it possible to link lifestyle and consumption patterns to the twin challenges of sustainability and equity. The most obvious case in point is oil: if the urban system is not restructured to reduce dependence of households and businesses on oil, those households and businesses that can move to localities where this reduced dependence has been achieved will naturally move. The urban poor will be the biggest losers because most of them lack the resources to move. Multiply out this logic across a range of other resource-dependent variables, and it becomes clear that sustainability is inextricably bound up with equity issues. The biggest challenge is to put in place frameworks and tools for transforming cities by building up 'sustainable neighbourhoods' from below.

Cape Town's Footprint[6]

It has been estimated that Cape Town's ecological footprint is 4,28 hectares per capita (ha/cap) . This means that 2,3 planets will be required if everyone lived in accordance with this average. This compares as follows to other contexts: Canada – 4.3 ha/cap, USA – 5.1 ha/cap, India – 0.4 ha/cap, World Average – 1.8 ha/cap. Gasson (2002) arrived at these

[6] This section is based on a seminal paper by Barry Gasson (2002). All the quantitative data and figures referred to in this section are derived from this paper.

estimates by following the generally accepted methodology to calculate "ecological footprints", i.e. calculating the inputs and outputs and reducing these to land area equivalents as follows:

Table 5: Cape Town's Footprint.

Inputs	*Tons*	*Land area equiv in sq km*
Fresh water	327 500 000	1 430
Coal	378 732	1 326
Oil	1 138 097	6 359
Gas	21 816	95
Wood	108 492	660
Building mats	5 994 113	31
Timber	69 844	425
Paper	395 000	3 091
Food	1 327 301	112 349
Outputs	*Tons*	*Land equiv in sq km*
Liquid wastes	200 300 000	13
Solid wastes	2 050 800	4,9
Gaseous wastes	5 209 200	2 480
Source: Gasson (2002)		

This results in a total ecological footprint of 128 264 square kilometres - of which the large majority (112 349 sq. kms.) is for food.[7] Given that there is an estimated 3 million people in Cape Town, this generates the footprint per capita of 4,28 ha/cap.

The most significant consequence of this input-output model is that it demonstrates how resource intensive the Cape Town urban system really is. Every oil price rise corresponds to net increases in the amounts of cash transferred from the Cape Town economy into national and global financial circuits. This means less cash is available in the local economy for households and businesses to circulate. Similarly for water, building materials, coal-based energy and, in particular, food supplies (whose prices are directly linked to the oil price due to the chemically dependent nature of our non-organic food production system). If future planning ignores the fact that the costs of these inputs are going to rise as the consequences of eco-system thresholds ripple through the urban economy, agreed outcomes will never be achieved. As will be demonstrated below, the 'developmental state' option makes precisely this mistake because it is premised on the 'consumption city' paradigm.

Even though Cape Town's existing water supplies are projected to run out in 2025, it manages water in an extremely inefficient and inequitable manner. 37% of all water used in Cape Town in 1998 was used by households. Of this, 21.3% was used to irrigate gardens and fill swimming pools. In 1990, high income households consumed 59% of domestic water, middle income households consumed 30%, and low income households 11%. While the

[7] This figure excludes the massive 2.5 billion tons/yr of sea water used to cool Koeberg power station (input), and the return to the sea of heated sea water (output). 58% of all CT's energy comes from Koeberg nuclear power station (Gasson 2002).

highest income bracket uses up nearly 60% of all domestic water (in 1998), 20% of all Capetonians had no piped water supply (in 2000).

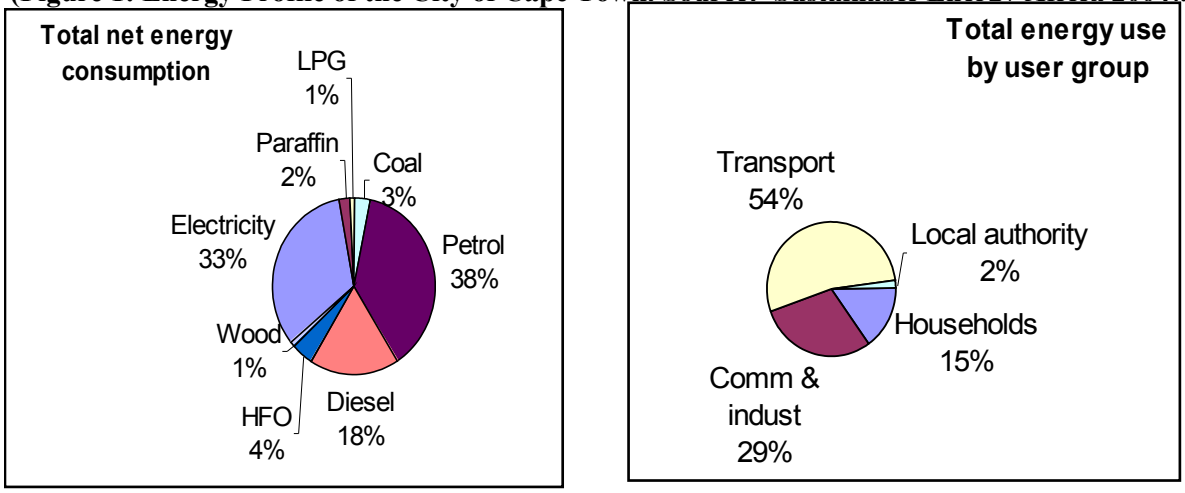
The ecological inefficiency of the existing water system is reflected in the fact that 61% of all water used in Cape Town was used to flush toilets and transport sewerage. This is potable water that has been purified at a costly water purification plant. However, 11% of the population had no water-borne sewerage. To make matters worse, of the 550 000 tons of sewerage pa, only 5% is recycled. This raises an obvious question: if the sewerage was productively re-used, would this generate enough savings (of purified water) and revenues (from the productive re-uses) to cover the cost of providing sanitation to the unserviced?

Cape Town generates a total of 2 million tons of waste p.a., or nearly 6000 tons per day. In 1998, residential waste accounted for nearly half of this, at 895 000 tons/year. The remainder was mainly industrial and commercial waste. Significantly, 60% of industrial waste is recycled, with only 6,5% of residential and commercial waste recycled. This is very low by international standards – some European cities recycle up to 40% of residential and commercial wastes. The bulk of this unrecycled waste goes to landfills located on the Cape Flats. There is evidence that toxins leaching these landfills are polluting the aquifers located below the Cape Flats (per correspondence, Ricky Murray). In addition, these landfills will be filled up within five years and the City Council is struggling to find alternative sites that are close enough not to push the transportation costs up too high. It is unlikely they will succeed which means either they adopt a new approach, or force up a cost for a service that mainly benefits the middle and richer households. Of the 895 000 tons of residential waste generated in 1998, no less than 492 967 tons (over 50%) were generated from the high (excluding the middle) income residential areas! This translates into 1,3 kg of waste/person/day for high income areas, 0,7 kg/person/day in middle income areas, and 0,35 kg/person/day in low income areas. This effectively means that the large poorer communities on the Cape Flats host rubbish dumps that absorb wastes generated by a tiny minority of rich Capetonians who have one of the highest waste levels and lowest recycling rates in the world. This is eco-inefficiency that is subsidized by nature and the poor.

It also needs to be noted that between 40% and 60% of the domestic waste stream is organic waste (from kitchens, garden cuttings, etc). This is a rich source of nutrients that could be composted and ploughed back into urban agriculture. Instead, it gets combined with all other wastes and dumped into toxic landfills. In the meantime, 1,3 million tons of food are imported from a land area equivalent of 112 000 sq. kms. (see Table 5) that stretches across the whole of South Africa, and beyond. Middle and high income households may be able to afford prices that include the costs of transporting all this food (fuel, cold storage, packaging, energy, etc), but this is certainly not the case for poor households. Imagine the beneficial consequences for poor households if food could be made more affordable by re-using composted urban organic wastes in local urban agricultural undertakings, and then selling the product at local neighbourhood retail markets. (Irrigation requirements can be reduced if organic farming practices are followed and more extensive use of on-site rainwater supplies are made - reference). In one stroke, the costs of long-distance transport, packaging, cold storage, middlemen costs (wholesalers, packagers, retailers) and chemical treatments can be eliminated from the cost of each item of fresh produce. Given that some estimates put the

combination of these costs at as much as 80% of the final cost before the final mark-up (which averages at 20%)[8], the consequences for the much talked about need for "food security", improved dietary health intake (to improve the immune system) and the need to reverse declines in expenditure on food in poor communities become obvious.

(Figure 1: Energy Profile of the City of Cape Town. Source: Sustainable Energy Africa 2004).



As far as energy consumption is concerned, petrol and diesel (both derived from imported oil) provide no less than 56% of total net energy consumed (see Figure 1). Grid electricity accounts for only 33%. Transportation consumes 54% of all energy, compared to 15% for households and 29% for businesses. These figures reveal how extremely vulnerable the Cape Town economy really is with respect to future oil price increases. From this analysis flows the importance of urgently reducing oil consumption by changing the transport system, densifying to reduce travel distances, and building mixed use settlements comprising residential, work and consumption spaces. If this is not done, Capetonians will end up working harder and harder in order to cover the costs of moving around an increasingly fragmented city.

Cape Town's ecological footprint of 4,28 ha/person is an average.

Profiling Capetonians

The primary data:[9]

- total population: 2,8 million and it is growing at 2,6%;
- race breakdown: 48% classify themselves as coloureds, 32% as black africans, and 20% as whites – the black African population is growing at the fastest rate, with in-migration from the Eastern Cape being a major cause of this growth;

[8] Based on personal experience when the author was involved in the design and establishment of a fresh produce packhouse for supplying Cape Town retailers.

[9] This primary data is derived from the Infrastructure Planning Database developed and maintained by the Palmer Development Group, Cape Town. The Palmer Development Group donated access to this database free of charge for this project. The database was commissioned by the Department of Provincial and Local Government and is extensively used by Municipalities to conduct long-term infrastructure planning studies. The Palmer Development Group have managed to populate this model with high quality data from the City of Cape Town. Data derived from this model will henceforth be referenced as PDG 2005.

- the total number of households in 2001 was 759 765 and is growing at 3.3% which means the city needs to plan for 25 000 new households each year;
- out of a total of at most 800 000 households in 2005, approximately 265 000 require access to formal housing;
- the number of people with access to basic services is much higher than the number who have formal houses – 90% of households have access to piped water on site, electricity and a flush toilet.
- although nearly 35% do not have access to formal houses, 29% are formally unemployed (with many of these people employed in the informal sector), which means around 1 million Capetonians are very poor.

What these figures do not reveal is the spatial distribution of Capetonians across the suburbs of Cape Town, and their corresponding life circumstances and lifestyles. Ironically, it is not the planners in government who seem to know this, but rather the highly sophisticated market analysts who create databases to service the private sector's desire for increasingly more precise definitions of the various 'market segments'. These databases are the veritable crystal balls of the 'consumption city' – they provide the data on spatial and consumption preferences that profoundly influence the locational decisions of retailers, investors, developers and households. By far the most powerful and penetrating is the ClusterPlus database developed by a Pretoria-based company called the Knowledge Factory. The Knowledge Factory makes the following claim about its database:

> "MarketPlus data sets represent *predictive estimates* for each statistic, not absolute counts. This research information can be used to determine market share, market potential and media planning." (emphasis added) (Knowledge Factor, n.d.)

A "predictive estimate" is essentially a claim about the "most likely" consumer behaviour of a person in a given set of circumstances, defined in this case by suburb. To be viable, the model must by definition exclude the possibility of radical changes in consumption patterns and the spatial flow of these patterns. In reality, however, these assumptions are changing, marked specifically by the rise of the oil price.

For the purpose of this paper, the primary categories of the Knowledge Factory ClusterPlus database will be used to reveal the connections between location, lifestyle and living standards. Examples of suburbs will be used to illustrate each category.

Using the ClusterPlus database it is possible to divide the suburbs of Cape Town into nine major categories and into a further 38 sub-categories. These sub-categories provide, from a consumer market analyst's point of view, an insight into the complex web of connections between disposable income, aspirations, consumer behaviour, assets, location and services. However, space limits are such that only the major categories can be assessed[10].

[10] Normally, Knowledge Factory would charge between R60 000 and R80 000 for the database that was used for this research project. However, the company agreed to allow the researchers free access due to the academic nature of the research. Furthermore, the company assembled specialist information not normally available in their databases for the purposes of this research project. The data has not be verified via triangulation with other data sources.

The categories referred to below are articulated using the terms that the Knowledge Factory uses because this provides an insight into the discourse used by the consumer market analyst to express the nature of these market segments. To this extent, the Knowledge Factory database is more than just a source of empirical information, it is also used here in a spirit of critical irony to reveal how the city's various segments are represented. These glib representations are not simply empirical descriptions, they are signifiers that act as conveyors of extremely powerful market information and financial flows that structure the evolution of the city in spatial and social hierarchical terms. Revealing these terms should help citizens comprehend why others act upon them using terms that the citizens did not invent. In some cases, certain groups may well be justifiably offended by the thinly disguised language of race and class that underpins these descriptions.

Group A: Silver Spoons
This is the South African elite, anointed through wealth and material achievement, living ostentatiously in places like Llandudno, Higgovale, Simons Town, Kalk Bay, Bloubergstrand, Plattekloof, Bishopscourt, Big Bay, Newlands and Helderberg Estate. They are described as the "well educated, well-travelled and well-off people" whose "living standards reflect their status as the first-class achievers in a first-world society". They are usually mature families with limited dependents who live mainly in older more established areas, or the new business elites whose properties boast of their newfound wealth. They are, however, typically found in old leafy established suburbs or new wave revamped trendy 'zones'. Their cars each cost more than the average Cape Town house. Their living standards reflect their status as "first class world citizens – achievers in a first world society!" They have "tasted the good life and accept nothing less".

Group B: Upper Middle Class
They form the storyline of almost all sitcoms. They can be found in Milnerton, Bellville, Durbanville, Kenilworth, Bishop Lavis, Southfield, Sybrand, Edgemead, Bosmans Estate (Kuilsriver), and Brackenfell. They walk the middle of the road looking left, right and then left again. They draw "middle income salaries, live in middle sized houses, have medium sized families and share middle-class values." Typically white collar with a growing proportion of blue collar workers with high educational levels makes them highly employable. DIY keeps the older than average neighbourhoods generally well maintained. Their homes are their castles and fortresses against eroding values, opportunities as they knew them and threats to their life styles. They also tend to be the nest in which they have all their eggs – they are therefore security conscious and risk adverse and are attracted increasingly into gated-communities.

Group C: Middle Suburbia
"The newly weds and close too nearly deads". They've spent much effort in gaining and retaining what the have, watching every cent and guarding against every perceived "threat", socially, economically and politically – they count their change but change itself is not that welcome. They live in Melkbosstrand, Kuilsriver, Fish Hoek, Plumstead, Dieprivier, Parow North, Oakdale (Bellville), Bergsig (Durbanville), Springbok Park (Brackenfell), Wynberg, Joostenberg (Kraaifontein), Strand, and Atlantic Beach Estate. They would however "love to move up the socio-economic ladder", but 7 out of 10 are employed, and are predominately

found in the low income professional bracket, technical arenas and clerical services – opportunities are simply limited. Hence they take nothing for granted, other than that their parents will do everything to enable their children to "achieve and make it out and up".

Group D: Community Nests

The clusters in this group are identified primarily by the characteristics of their built environment - larger blocks of flats and town house complexes with single homes between. Most varied of all groups, both in demographic profile and dwelling type, the older and wealthier part and the "up and coming Afro-cosmopolitan society form a melting pot." Places like Vredehoek, Gardens, Greenpoint, Mowbray, Cape Town Centre, Sea Point, and even Rosebank come to mind. Neighbourhoods in this group, with the exception of a few new townhouse developments, are typically close to the city centre and the majority of residents rent their accommodation. In earlier years, most of these were considered cosmopolitan and highly aspirational. They still are, but for a very different mix. Residents are typically lower middle-income earners in blue and white collar occupations, with a significant number of people in community and government services.

Group E: Labour Pool

"They know the value of money because they have had to work for it." But even more so, they know the value of family and community because it works for them when money doesn't. This is most reminiscent of small town closeness in the city. They can be found in Woodstock, Salt River, Lansdowne, Charlesville, Maycape (Blue Downs), Peerless Park (Kraaifontein), University Estate, Heathfield, Maitland, Rylands, Gatesville, and Vanguard. Households consist of an established family, normally with children. The old neighbourhoods are a mixture of dwelling types with houses being the majority and the individual 3 bedroom homes, often but not always with a rundown look. They are lower-middle income earners with mostly a secondary level education.

Group F: New Bonds

The first generation of new parents of the "democratic South Africa, determined to assert their rights to equal opportunities for themselves and particularly, their children." For the majority, the opportunity and responsibility of South Africa are embodied in property ownership coupled with decent services – a right their parents did not have. They are laying the foundation of a new generation. The target of every developer, suburb names tell a mixed story of struggle and the spin of the developer: Joe Slovo Park, Weltevreden Valley (Mitchells Plain), High Gate (Blue Downs), parts of Khayelitsha, Croydon (Macassar), Phoenix (Milnerton), Eersterivier South, Pelikan Park, Guguletu, Montana, Cravenby, Belhar, Silversands, Southfork and – yes, wait for it – Camelot!

Group G: Township Living

The row upon row of houses definitely does not reflect the DNA of these groups, rather the forging of a unique "soul of the new South Africa that is in itself diverse" but simply strung together by group values, whether it is an older traditional core or the hip culture of the younger generation. The physical environment has its roots in the old council design, but has been embellished with people who are determined to reflect their personality on the old bland originals. These suburbs include Nyanga, Crossroads, Tafelsig, Roosendal, parts of

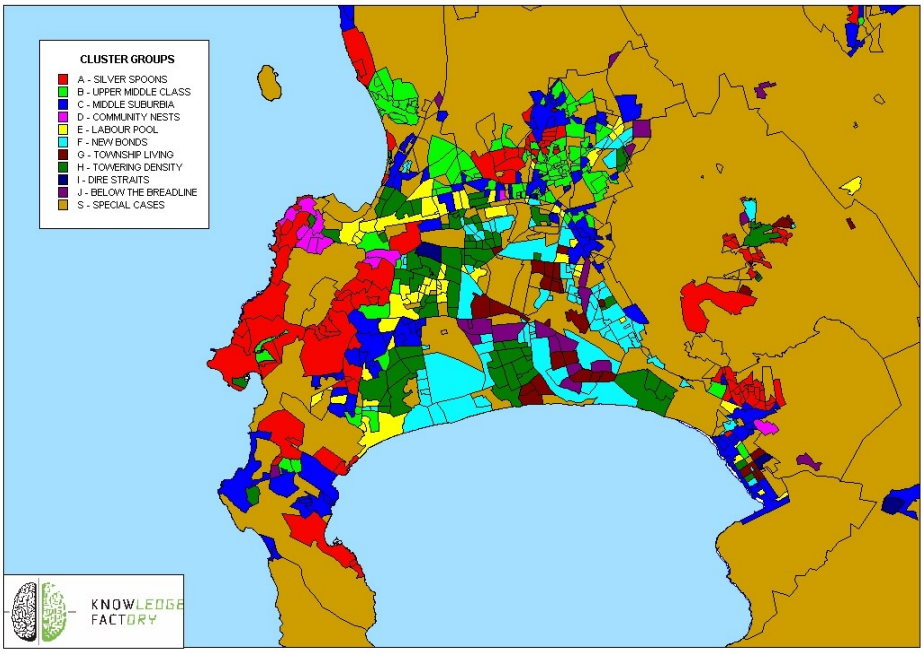
Khayelitsha, Mfuleni, Wesbank, Louis Rood (Strandfontein), and Casablanca (Strand). Unemployment is high, and so is a sense of community that has against adversity created a "culture and vibrancy that stands uniquely South African." (reference)

Group H: Towering Density
Hard evidence of social engineering "gone horribly wrong". High hopes and a low educational base find themselves in crude tenement high rise blocks, badly structured low-cost semi-detached council houses, or inner-city blocks that have all fallen victim to decay. Teetering but not falling as they are propped up by an inner vision of a better life that is sustained by TV images, those that thrive from organised crime and the community leaders that keep the community projects going. Scattered around, these suburbs are in Rugby, Glen Lily, Brooklyn, Ruyterwacht, Riverton and Vasco.

Group I: Dire Straits
Sinking townships, bursting at the seams. The local authorities of the previous regime planned many of these "ships" with a typical "third class fare" - four-berth quarters and single-berth hostels. Today every bit of space has been utilised as old structures form the basis for an extension or the creation of a dilapidated shack. Naturally this overcrowding has placed unprecedented pressure on infrastructure and social services. No amount of life boats will save the situation without actually changing the situation. But life goes on – the music blares, the street markets thrive, the informal sector mushrooms, do-gooders enter and leave, and generations pass through. Langa, Lwandle, Imajamojea, Avondale and Protea Park come to mind.

Group J: Below the Breadline
These are the self made "rafts" on the sea of adversity, informal settlements of shacks of varied built quality and size. Home to over 100 000 households, they include Dunoon, Site C Khayelitsha, Wallacedene, Masiphumelele, Browns Farm, Joe Slovo, Philippi, and Bloekombos. "Low everything, except for unemployment and tenacity, is the adjective used to describe the living standards and opportunities that confront reality each day." Social services and grants are the life lines to a better future, and government investments are beginning to show benefits in low cost housing, schooling and clinics. The targets of the N2 Gateway mega-project, most of these people could soon be living in brand new walk-ups rented from the City Council.

Together, these strata can be represented as follows:



Map 1: Colour Coded Breakdown of Cape Town's Suburbs According to Cluster Category

There are nearly 800 000 households (or 760 000 at the time of the 2001 Census) spread out across these nine suburban types. Based on various cross-tabulations from the Knowledge Factory's ClusterPlus Database, it was possible to calculate the number of households for each category as follows:

Table 6: Households According to Cluster Category. Source: Knowledge Factory, 2005

Cluster Group	% of suburbs	No of households	% of total households
Silver Spoons	14	54 630	7
Upper Middle Class	19	68 129	9
Sub-total	*33*	*122 759*	*16*
Middle Suburbia	20	77 380	10
Community Nests	1.5	17 564	2
Labour Pool	9.5	42 404	6
New Bonds	13.5	101 638	13
Sub-total	*44.5*	*238 986*	*31*
Township Living	4.5	80 980	11
Towering Density	13	170 752	22
Dire Straits	2	26 108	3
Below the breadline	3	111 770	15
Sub-total	*22.5*	*389 610*	*51*

Table 6 would suggest that the Cape Town elite comprises 16% of the households, the middle class 31% and the poor and working class 51%. Significantly, over 100 000 households comprising 15% of the households that make up the city live in shack settlements.

For many of the poorest neighbourhoods (located in Categories G, H, I, and J), sustainability means in the first instance investments in decent housing, more and better services, and neighbourhood facilities and infrastructure (both built and natural). However, their limited household incomes means they need to be protected from service systems that will be a constant drain on their finances, such as energy systems that are dependent on oil or grid electricity, transport systems that will become increasingly expensive as the oil price goes up, and sanitation options that become increasingly costly to maintain. Solar water heaters and LP gas stoves solve most of the first problem, rail and taxis that run on biogas or hydrogen resolve the second problem. Both are technically feasible, cheaper to operate and cost less on the capital account (see Lichtman, 2003). The only scarce commodity is the imagination that is required to make it happen.

In the next section we develop a footprint analysis for a sample of these suburbs. Our aim is twofold: to show how rising consumption is coupled to an expanding footprint, and why it is important to build up a neighbourhood-based analysis of sustainability interventions. The analysis confirms the linkage between footprint and consumption.

Using the databases provided by the Knowledge Factory in conjunction with in-depth interviews with a sample of households drawn from the different cluster groups, it was possible to calculate footprints for the different suburb categories using a web-based data processing facility provided by www.earthday.org. The factors that were taken into account were as follows: diet (in particular the quantity of meat in the diet); how much of the food bought by the household is processed and/or packaged; whether waste disposed of is higher, or lower or similar to others in the neighbourhood; size of family; size of house; type of house (including whether or not the house has a water supply); electricity supply; distance travelled by public transport each week; distance travelled by car each week; flying time; litres of fuel consumed by car per 100 kms (if the family owns a car); and how often one travels with/as a passenger. The result was a calculation of the footprint in terms of hectares and how many planets will be required if everyone lived the same way as the people in a given suburb. This was followed by a second calculation whereby the footprint of the same family with the same income living in the same area was worked out but with the following adjustments: the house was built in accordance with a 'green design' (i.e. proper north-south orientation, low impact building materials, efficient use of energy and water, proper insulation, etc); use of more energy efficient devices; reduced quantity of waste (via separation for recycling); more energy efficient cars used (for those who could afford a car); more public transport used; walking to local facilities and shops made easier by a 'walking distance' approach to planning the densification and the location of facilities and shops; and those who previously lacked an in-house water and electricity supply benefited from a programme of basic services delivery. The results of this 'before-and-after' exercise are captured in the table below:

Table 7: Comparison of Footprints with/without EcoEfficiencies

Cluster group	**Key characteristics**	**% of total households in Cape Town**	**Planets required before/after eco-efficiency**	
			before	*after*

CATEGORY A: SILVER SPOONS	elite, largest consumers, getting richer	7	14.8	2-3.8
CATEGORY B; UPPER MIDDLE CLASS	established, mature, conservative, professionals, gated	9	5.8	2
CATEGORY C: MIDDLE SUBURBIA	tight budgets, mid-level jobs, bargain hunters, big spending on educating children	10	4.7 – 5.2	1.7
CATEGORY D: COMMUNITY NESTS	mixed, Afro-cosmo, shifting, small spaces, stylish, café culture, dense	2	2.4 – 2.7	1.1
CATEGORY E: LABOUR POOL	high density family neighbourhoods, stable jobs, secondary education, struggling	6	1.5	1
CATEGORY F: NEW BONDS	new SA families, youngish, targets of the developers	13	1-2	1
CATEGORY G: TOWNSHIP LIVING	old places, few jobs, youth cultures, soul of the new SA, buzzy, vulnerable	11	1	1
CATEGORY H: TOWERING DENSITY	teetering, high hopes, few options, the educated leave as soon as possible, limited reinvestment	22	1	1
CATEGORY I: DIRE STRAITS	old places, overcrowded, services collapsing, high unemployment, decaying	3	1	1
CATEGORY J: BELOW THE BREADLINE	shack settlements, desperation, insecurity	15	1	1

This table reveals the impact of eco-efficiency interventions. These interventions are a combination of private decisions (e.g. flying time, type of car, amount of meat eaten), but are also dependent on sustainability interventions at neighbourhood level, e.g. provision of improved and safer public transport, a 'walking distance' approach to neighbourhood planning, bye-laws governing house design and energy efficiency, the provision of a waste separation and recycling service, and even investments in food markets to encourage reductions in the consumption of meat and reductions in the purchase of processed or packaged food. Although further research is required, based on experiences in other cities,, it has been assumed that eco-efficiencies translate into savings for households, businesses and

the municipality. The argument is no different to the argument that Telkom's high charges should be decreased to reduce the cost of doing business or running a household in South Africa. Based on a review of the technical and financial evidence, Lichtman (2003), for example, has hypothesized that 5% of the Regional Geographical Product of a metropolitan region is spent on energy, water and waste services. A mere ten percent saving caused by the introduction of eco-efficient technologies would, in a metropolitan area the size of Cape Town, generate a saving of R300 million.

An ecologically oriented Integrated Development Plan for Cape Town should address the enormously costly resource inefficiencies that clearly make sustainable living choices at the household and neighbourhood level in Cape Town extremely difficult. Furthermore, it is difficult to see how poverty eradication in Cape Town is a realistic goal if scarce financial resources and free services from nature (water, absorption of wastes in landfills and water sinks, etc) are wasted on maintaining an ecologically unsustainable system that works in financial terms for the middle and high income communities, but tends to be too costly for those poor households that are lucky enough to be serviced.

As already mentioned, it is often the engineering profession that monopolises the knowledge about infrastructures that have the most significant impact on sustainability. A model now exists that questions the standard assumptions. The Lynedoch EcoVillage model outside Stellenbosch has demonstrated that it is possible to treat all sewerage on site and re-use the treated sewerage for on-site food production and as a secondary supply to households for toilet flushing and irrigation. This will reduce the use of water supplied by the municipality by 45% per household. This will reduce the costs of water for poor households by 95% and by 75% for middle income households[11]. It has also proven that revenues can be generated by separating waste and selling it to recyclers. Furthermore, energy costs can be reduced by up to 60% if solar water heaters and LP Gas stoves are utilized, north orientations are correct, building is done with unfired clay brick, and proper insulation is installed. There is no longer an excuse for settling for traditional engineering standards that allow the middle class to be subsidized by nature and the poor (who lose out because funds get sucked up by unsustainable systems that are regarded as the "industry norm".) Although the Lynedoch EcoVillage is not yet a net generator of energy and has a way to go before it is totally zero waste and dependent on locally grown food supplies, it is gradually moving in this direction. Monitoring of the Lynedoch EcoVillage Development will provide the indicators that could be used to benchmark future developments. However, it is a simple act of logic to conclude from the Lynedoch case that both the capital cost and operating costs of municipal infrastructure services will be reduced if eco-efficiencies are introduced.

Although Lynedoch is a relatively small development and it was possible to build in eco-efficient technologies from the start, there are literally thousands of these kinds of developments all over the world. Some are being built in high density inner-city UK cities, while others like Auroville in India are new settlements that emerged on vacant land. Still others such as Curitiba were implemented at city-wide levels, while others are private initiatives by developers. The quite famous "BEDZED" model in the UK is often referred to

[11] Primary data from financial models used to plan and construct the infrastructure.

as a model (see www.bioregional.net) and numerous cases are cited in Beatley (2000). In all cases, the eco-efficiencies introduced at Lynedoch are common in one way or another.

In the section that follows, the "developmental state option" will be discussed. Using data on what it will cost to deliver infrastructure services to all Capetonians by 2014, it is possible to anticipate the developmental state approach and financial implications. However, in the longer run this approach will fail due to the failure to take into account underlying sustainability issues.

Developmental State Option

Using the Palmer Development Group model, it is possible to provide future projections for what it will cost the City to meet infrastructure backlogs and future ongoing demand for the ten year period 2004 to 2014. The following assumptions have been made in the model:

- Number of users (or what the model calls 'customer units')[12]: 676 740 in 2004; 704 190 in 2009; 720 012 in 2014
- Average annual economic growth rate for the period: 3.5%
- Average annual inflation rate for the period: 6%
- Cost increases for key inputs such as oil, water and food: rate of inflation.

The infrastructure targets have been set as follows:

1. Water: in-house water supply for all by 2014

   Progress towards target:
   2004: 78% of formal houses, 12% informal houses
   2009: 76% of formal houses, 40% of informal houses
   2014: 100% of all houses

2. Sanitation: full water-borne sewerage for all houses by 2014

   Progress to target:
   2004: 98% of formal houses, 56% of informal houses
   2009: 97% of formal houses, 39% of informal houses
   2014: 96% of all houses

3. Energy: 60 A energy supply to all houses with following targets:

   - 2004: 26% formal houses, 8% informal houses
   - 2009: 67% formal houses, 55% informal houses
   - 2014: 100% of all houses

[12] This is not synonymous with the number of householders, e.g. an old age home may be one user, or a business.

4. Roads: the rate of development of new and upgrading of existing roads has been pegged to household growth rates resulting in the following:

   Class 3 metro roads: 0.1%
   Class 4 district roads: 0.25%
   Class 5 streets: 1%
   Class 6 rural: 0.25%

5. Solid waste: door-to-door solid waste removal service for all houses by 2014.

All the above projections assume that there will be no policy on eco-efficiency and sustainable resource use with respect to infrastructure planning. In other words, the following assumptions underpin the above estimates:

- Water: no household water saving devices to save water consumption by household, no household or neighbourhood-based water treatment and re-use systems, no rainwater harvesting, and limited densification. The cost of resolving the problem of limited supply of water has not been factored in. It assumes that the costs of an effective bulk storage and leakage management system have been included.
- Sanitation: conventional treatment systems, continuation of existing limited biogas production for limited use, and limited densification, i.e. no major biogas alternatives, or neighbourhood-based alternatives such as the Biolytix treatment system. Environmental costs are externalised.
- Energy: no energy efficient systems such as solar water heaters, photovoltaics, compulsory use of CFLs (Compact Fluorescent lighting) or wind power, and no changes to building bye-laws requiring insulation, north-south orientations, overhangs, certain kinds of building materials, etc. Also, energy price rises pegged to inflation.
- Roads: limited densification and continuation of existing public transport policy. Also assumes that oil price will rise with inflation and therefore no major impediment is envisaged to private and oil-based public transportation systems.
- Solid waste: this assumes the continuation of the existing system, i.e. limited recycling of residential waste, with the top 16% of households responsible for 50% of the solid waste stream.

The financial results generated by the Palmer Development Group for Cape Town are as follows:

Table 8: Costs of Meeting all Infrastructure Requirements by 2014. Source: Palmer Development Group Model.

Total capital requirement (millions Real)											
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Water	128	166	176	168	134	103	101	101	101	102	1,280
Sanitation	124	106	120	128	127	122	107	93	88	88	1,103

Electricity	85	88	93	98	100	101	97	91	85	79	918
Solid Waste	0	0	0	0	0	0	0	0	0	0	3
Roads	178	201	211	209	178	147	145	143	146	34	1,592
Total	539	596	648	659	592	519	481	447	432	315	5,228
Grants and subsidies	285	346	384	391	331	281	258	233	220	210	2,940
Borrowing	254	250	264	268	261	238	223	214	212	105	2,288

In order to reflect the impact of the ongoing operating costs of extended infrastructure and of borrowing, the PDG model reduced the municipal operating budget to an amount payable per "customer unit" (CU) – i.e. user - per month (see Table 9). These figures are reflected here as an average, although in reality the model splits the charges between a "low-income" and a "high-income" charge. The revenue column is what each CU will be expected to pay. It is clear that the increase is just over R300 per month in real terms. In reality, low-income households will pay less, and their rate of increase can be lowered by increasing the payments payable by high-income CUs and businesses.

Table 9: Savings Generated by EcoEfficient Technologies. Source: calculated using the Palmer Development Group module and Lichtman (2003).

Operating costs						
	2004 actual		2009 model		2014 model	
	Expenses	Revenue	expenses	Revenue	Expenses	revenue
Rand/cu/month	1,062	1,062	951	1,010	1,362	1,385
No of Cus	676,740		704,190		720,012	
Total expenses	718,657,221		669,751,795		980,845,597	
5% saving for eco-efficiency	35,932,861		33,487,590		49,042,280	

As far as housing is concerned, the current backlog is assumed to be 265 000. This is broken down as follows: 110 000 in shack settlements, 50 000 in backyards, 25 000 in serviced sites, 60 000 in overcrowded areas, and 15 000 are inhabited by households that could build formal houses if they had access to credit. The N2 Gateway project aimed at building 24 000 units will make an important but relatively small dent in this enormous backlog[13]. At a price tag of R2,6 billion, this would suggest a rounded off cost of R100 000 per unit for bulk, link and site infrastructure, plus top structures, i.e. a total of R24 billion to meet the backlog only. At current rates of delivery, this will take ten years and not meet the new needs caused by in-migration, natural increase and increase in numbers of households as larger single households split into multiple units.

[13] All primary data on the costs of the N2 Gateway have been derived from primary data provided by the City of Cape Town.

Table 10 is the current estimated budget for the N2 Gateway, i.e. for only 24 000 units (excluding professional fees, various preparatory measures, community development, etc)[14]. By far the large bulk will be financed by National Government grants.

Table 10: Estimated Costs of N2 Gateway (minus salaries, etc). Source: City of Cape Town.

	Units	Cost P/Unit	BUDGET
BULK AND LINK ENGINEERING SERVICES			
Water		N/a	52 910 000
Transport/Roads		N/a	232 442 000
Electricity		N/a	97 135 000
Community Services		N/a	165 377 000
Regional Facilities		N/a	187 586 000
Subtotal Bulk & Link Engineering Services			**735 450 000**
HOUSING			
Multi Storey Units			
Site Infrastructure	16 727	4 500	75 272 400
Top Structures	16 727	75 600	1 264 576 320
Single Residential Units			
Site Infrastructure	7 169	15 108	108 309 765
Top Structures	7 169	25 510	182 875 063
Subtotal Housing			**1631 033 548**

Whereas the ongoing operating costs of this project are included in the PDG budget, the cost of operating and maintaining the rental stock is not. It has been assumed by state planners that rental income will cover the costs of operations and maintenance and that if not, the difference will be cross-subsidized by the metropolitan tax base. This is possible to envisage for the first phase of 24 000 units, but difficult to imagine for subsequent phases. Furthermore, the models are extremely sensitive to slight fluctuations, in particular a drop in economic growth rates, a rise in the unemployment rate, and, in particular, to rises in the operating costs. (The direct and indirect impact of oil and water price increases have not been factored into any of the models.) Once again, this brings into focus eco-efficiency factors, in particular what rising energy and water costs will do to the local economy (and therefore employment levels) and to household economies which may, in turn, result in a steadily increasing financial burden on middle and high income households. If the barriers to entry into the middle class are hamstrung by high household costs, this has both negative political and economic implications given that these households should be leading the expansion of the local market for various categories of consumer goods.

The key financial assumptions of the N2 Gateway are as follows:

[14] These estimates change all the time. This is not the final officially approved budget.. This is the budget devised by the National Department of Housing as interpreted by the City of Cape Town.

- Housing typology is based on an allocation of 70:30 - multi-storey units: stand alone units
- Multi-storey units retained (in the short/medium term) by the City as rental stock
- Unit cost: within subsidy band (for stand alone unit)
- Top structure cost: R75 600 per multi-storey unit (36m² x R2100/m²)
- The total current subsidy for stand alone housing units is R40 618 per unit for all households with a monthly income of less than R1 500 per month.
- Serviced sites: State grant funds are received, in terms of the existing Upgrade of Informal Settlements (UISP)/Housing Subsidy Programs
- Stand alone top structures: State grants are received, in terms of the Housing Subsidy Program, for the top structures of stand alone units
- Multi storey unit top structure: State grants are received for the top structures of multi storey units (grant = cost of unit)
- Rental charges will, for the purpose of equity, be based on the current Council approved rental charge structure
- All City retained rental units can access the Rental Indigent Grant funded by the City

In summary, there are three distinctive features of the developmental state option which envisages the extension of the 'consumption neighbourhood' model to all Capetonians over the next ten years:

- the enormous impact on everyday life as nearly half the population moves from living in a shack to living in a formal house, ideally in formally planned neighbourhoods;
- the limits to affordability for households (transport, service costs) and the tax base if densification fails to take place due to failures to release the large chunks of state-owned inner city land resulting in further outward sprawl;
- the extremely negative medium- to long-term impact of conventional infrastructure technologies (to build the 'consumption neighbourhood' in ways that suit the professionals, developers and contractors) on capital budgets, operating budgets, households, and businesses due to the constrictive consequences of leakage out of the local economy (mainly for energy, food and water) and the diversion of disposable income into transport and services rather than into assets and consumables.

The Achilles heal of the developmental state option is the impact on businesses, households and the Cape Town economy as a whole of rising oil, water and food prices. Most of the models being used by planners in government and in the consulting industry assume these three costs will rise with inflation. There is little evidence to support this, with oil price rises over the past year being a case in point. The consequences are that growth will be less and unemployment higher than most models suggest which calls into question the decisions being made based on these models.

Sustainable Development Option

As already argued, the 'Sustainable Development' option aims to build 'sustainable neighbourhoods' as the building blocks for a sustainable urban future. The aim is to reduce the ecological footprint of over-consumers without fundamentally altering their lifestyles , and by investing in infrastructure and housing that is designed to protect poorer houses from future ecological and economic challenges that could undermine their struggle for a better

life. Footprint reduction for the over-consumers can be achieved in new developments and by retrofitting existing buildings and suburbs. For example, in quite a number of cities around the world, bye-laws are being passed that make it compulsory to replace incandescent globes with compact fluorescent lighting, electric geysers with solar water geysers and to install proper insulation where this might not exist. These three measures alone can reduce total consumption of electricity by as much as 60%. Major retrofits of commercial buildings to replace inefficient air-conditioning, lighting and water supply systems has proven to be the cause of major operational savings. Once footprint reduction is coupled to the elimination of infrastructure, housing and service backlogs, an urban system starts to emerge that reduces the cost of doing business for businesses and the cost of living for middle and lower-income households. To this extent, the 'sustainable development' option is profoundly rooted in the dynamics of the real economy. Specifically, it differs from the 'Developmental State' option in four important respects:

- firstly, the massive expenditures over the next decade that will be spent on professional fees, social learning at community level, infrastructure and house building should be creatively channelled into an imaginative programme to build ***'sustainable neighbourhoods'*** that are child-centred, mixed, safe, healthy, accessible via public transport and connected via walking distances to local food markets and other commercial and public facilities;
- secondly, in order to densify and make public transport viable on a mass scale, ***poorer households are brought back into the city*** and integrated into socially mixed ecologically designed inner city neighbourhoods in a way that boosts the inner-city economy thus outweighing the short-term financial 'devaluation' of these properties;
- thirdly, like cities around the world that have made sustainability a cornerstone of the future, long-term partnerships are established with ***knowledge institutions*** that are mandated to focus on building the transdisciplinary knowledge base that will be required to make the transition from the 'consumption city' to the 'sustainable city';
- fourthly, the ***economics of sustainable resource use*** is factored into all planning, in particular the costs of known constraints such as finite water supplies and rising oil prices, the economic job-creating potential of eco-efficient technologies such as waste recycling, the renewable energy economy and urban agriculture (including food markets).

As far as expenditure is concerned, the size of the City's capital budget for the 'sustainable development' option will be much the same, although eco-efficiencies will result in lower operating costs. However, this will not necessarily translate into lower charges for middle and high income areas, but rather a 5% 'eco-efficiency dividend' could be used to cross-subsidize the operating costs of the approximately new rental units that the City will be responsible for. A 5% saving on what is spent on water, energy and waste service could generate R300 million for investment in poor areas without increasing the tax burden (Lichtman 2003). In particular, this will be more than enough to cover the operating costs of the new rental stock, taking into account the costs of implementing the indigence policy.

A 'sustainable development' approach will discourage the building of exclusive low-income suburbs. Besides all the social reasons for why the continuation of social apartheid is a bad

idea, the economic reason is simple: by investing R75 000 to create a serviced house for a poor family in a uniformly poor neighbourhood, the value of that asset is the same - if not less - after occupation and/or sale. The same asset constructed in a mixed neighbourhood where there is a more active housing market can have a market value that is three to five times the value of the initial subsidy without any cross-subsidisation. This may well push down values of houses in the suburbs, but the social benefits of living in a city that is not wracked by the dysfunctionalities that are caused by social apartheid, poverty and marginalisation may well outweigh capital wealth. Simply by being creative with space, zoning, bye-laws and planning instruments, the same investment can generate much greater returns for poor households. This, when coupled to eco-efficiencies, can contribute significantly to local economic growth stimulated by a virtuous cycle of access to credit, more disposable income, higher re-investment levels back in the neighbourhood, reduced leakage as the benefits of eco-efficiencies kick in, and as local food markets reduce the costs of healthy eating.

A 'sustainable neighbourhoods' approach will not be limited to the 'new neighbourhoods' that will emerge at both the lower income and upper income ends of the property development market. Instead, it is an approach that could be made applicable to all neighbourhoods, including existing ones by building on the experience of the City Improvement Districts (CID) concept. The "E-CIDs" (Ecological City Improvement Districts) could generate extra funds (as they do now via the extra levies raised from property owners who own properties in an area that falls within a CID) and draw down incentives to transform existing middle and upper income neighbourhoods by providing both knowledge inputs and goods such as approved CFLs, rainwater tanks, solar water heaters, insulation, geothermal heating and cooling systems, on-site or neighbourhood-based sewerage treatment systems, water conserving irrigation systems, organic garden treatments, etc. Like in New Zealand and other places, incentives could be provided to disconnect from the sanitation system and the grid thus saving on capacity upgrades and reducing operating costs as households take over some costs.

Once the city is re-conceptualised as a patchwork quilt of 'sustainable neighbourhoods', the following checklist could be used for designing interventions at the household, neighbourhood and city-wide levels[15]:

- ***Transition to renewable energy alternatives and energy efficiency*** Following many examples elsewhere, investments in the renewable energy economy emerge as a result of a massive demand for new household items required by new bye-laws: solar water heaters, CFLs (and related fittings), windmills, photovoltaic systems (connected to the grid), LP gas stoves and automobile retrofits, hydrogen gas storage and transport systems, building retrofits to take advantage of passive heating and cooling systems, massive industry-wide retrofits to replace air-conditioning and lighting systems of commercial/industrial buildings, and a much wider range of cheaper insulation systems.

[15] This checklist emerges from a combination of the core principles advocated by Bioregional (www.bioregional.com) and the sustainability criteria developed by Swilling (2005).

- ***Zero waste via re-use of all waste outputs as productive inputs*** Waste separation at source across all households and businesses creates a new recycling industry. Although one third of all registered recyclers in SA are in Cape Town, this suddenly mushrooms to three quarters creating many new jobs.
- ***Sustainable transport, with a major focus on public transport*** The transport sector should be united around a range of new multi-billion rand investments to halve the dependence on oil by 2014. These include biogas, biofuels (e.g. biodiesel, bioethanol, hydrogen, LP gas), rail transport connected to as much renewable energy as possible, eco-efficiency cars, etc. Reduced expenditure on roads and increased expenditure on efficient and safe public transport systems makes it possible to grow the city economy without losing all the gains to massive leakages as the oil price rises.
- ***Sustainable construction materials and building methods*** The Netherlands has developed a sophisticated user-friendly computer-based tool for assessing the building materials selected for constructing a particular building. It is a massive database of all the materials used in construction, plus suppliers and technical specifications. Each material is given a rating which means that the ecological and social cost of a building can be calculated in advance. This immediately reinforces the local economy because the easiest way to reduce the ecological footprint of your building is to source local materials. It also improves accountability (by, for example, revealing whether hardwoods come from sustainable forests or not) and the health impact of materials (such as paints, most of which have a toxic release).
- ***Local and sustainable food*** Cape Town's dependence on long-distance food supply chains from non-organic agricultural sectors results in a massive footprint. This makes all Cape Town households extremely vulnerable from a food security point of view in the medium- to long-term. These long-established supply chains also undermine land reform in the Western Cape. They are oil and water intensive and therefore food price increases are inevitable. The obvious solution is the relatively low cost regulatory and investment strategy to create neighbourhood-level spaces for food markets where farmers and growers can sell directly to households. This reduces prices for the consumer and increases the returns for farmers. It also stimulates the growth of local small-scale growers who tend be much less dependent on oil and more efficient users of water. Although the success of this approach has been proven countless times in the developed and developing world (Norberg-Hodge, Goering and Page 2001), Cuba is the world leader in this regard (Funes, Garcia, Bourque, Perez and Rosset 2002). .
- ***Sustainable water use and re-use of treated sewerage*** Neighbourhood-level interventions include ensuring local retailers supply water saving devices (low flush systems, aerated tap nozzles, etc) plus rainwater harvesting systems. Grey water re-use systems are also viable at household and neighbourhood level. However, neighbourhood-level sewerage treatment systems are viable, with the treated effluent feeding into nurseries, orchards or back into the houses to flush the toilets. These systems can be coupled to better management of the commons such as wetlands, recreational spaces, etc. Bio-gas digesters are being used all over the world, including in hi-tech centres like Stockholm where the entire city bus fleet and municipal vehicle fleet is fuelled by biogas captured from bio-gas digesters that process sewerage and organic wastes. At a city-wide level improved leakage management and long-term access to an affordable bulk supply are key priorities. In this regard, the well

researched option of sustainable management of aquifers needs to be included into long-term planning and further dam construction de-emphasized due to its cost and low-level efficiencies. Sustainable aquifer management is a new global trend, with Namibia setting the lead. Why can't the Western Cape follow this lead?

- ***Enhancing biodiversity and the preservation of natural habitats*** Although under-emphasized in this paper due to the need to emphasize aspects of sustainability that are rarely discussed, it is obvious that natural biodiversity is a key asset of the City and must be cared for in every possible way.
- ***Valuing authentic cultural diversity, community and citizen participation*** These aspects are always included in developmental strategies at all levels, but their significance gets buried by the logic and force of the values that sustain the 'consumption neighbourhood' – the mall, the move theatre, the fast food chains, mainstream global music, clothing brands, the video stores and most TV. What about all the other things that happen? - community building via shared problem solving at policing forums, the development of a musical culture via the thousands of choir groups, the high levels of participation in religious activities, youth sub-cultures around certain kinds of music and styles, women's savings clubs, community-based house building. These also take place, but in discrete disconnected ways. These activities become crucial when it comes to building sustainable neighbourhoods.
- ***Equity and fair trade at all levels (global, regional and local)*** Although increasingly common across many value chains at the local and global levels in many other parts of the world, there is little evidence that the local Cape Town discussion about ways of growing the economy have factored in a value chain approach that takes into account equity and fair trade issues. The Proudly South African campaign is clearly a key reference point when it comes to branding, but this way of thinking does not seem to have penetrated into the discussion of micro-enterprise development which remains fixated on the traditional concerns of this sector – namely micro-entrepreneurs and how to secure finance and opportunity for them. An equity and fair trade perspective looks at value chains and how these can be restructured to advantage smaller players and build local economies. Local credit systems, through to sophisticated ways of linking waste streams from certain industries to the input streams of others are some of the ways that employment is created without depending purely on new investment. Local food markets could well become the key locus for an equity and fair trade focus because they represent a key shift from a 'fast food' culture to a 'slow food' culture whereby buying and eating food slowly with others becomes part of building solidarity, community and therefore safety.
- ***Health, well-being and soulfulness*** Notwithstanding the human suffering stemming from HIV/AIDS, the positive side of the HIV/AIDS pandemic is that it has stimulated a social and cultural movement that is starting to change the way we understand health, diet, sexual practices, and care of sick and dying. This, in turn, should reinforce community building, 'slow food' movements and child-centred planning, and validate the 'deep ecology' connection to nature, beauty and soulfulness.

Conclusion: Manifesto for Sustainable Neighbourhoods

The primary aim of this paper was to demonstrate the linkages between lifestyle, the structure and spatial operation of the urban system which contains and constrains these lifestyles, and

the consequences of the gradual depletion of free eco-system services for the way the urban system is imagined and lifestyles perpetuated. It was argued that a conventional developmental state approach will proceed on the assumption that the conditions for unlimited ecosystem services will remain unchanged. This despite incontrovertible evidence to the contrary. However, this is evidence that emerges in disciplines that have limited influence within the professions that supply the policy-makers with expertise and advice. General management, policy science, economics, development studies, law and the social sciences all share a remarkable capacity to deny harsh ecological realities that are already translating into problematic economic and social realities (e.g. rising oil and food prices). It was argued, however, that urban systems can be changed so that they become more sustainable and in so doing, a new range of economic and social benefits start to emerge. Many examples were cited of the kinds of actions that can be taken to reduce the energy intensivity of the city, recycle water and waste, open up local food markets, build better buildings and generally create a new culture of learning, community solidarity and non-violence.

The ten points discussed in the previous section are effectively the key elements of a 'sustainable neighbourhood manifesto'. They provide the basis for imagining a sustainable Cape Town in 2025. They express in practical do-able ways the well worn principles of equity, integration and sustainability that have informed the analysis of this paper. They are, ultimately, ways of achieving the goals of the developmental state without falling into the trap of denying the resource constraints that the sustainable development perspective forces us to think about.

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