"The Future is Urban"
Challenge of Sustainable Urban Development in the Caribbean: The Search for Sustainable Urban Forms

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Abstract

The purpose of this paper is to provide an overview of urbanisation in the Caribbean and to determine a way forward in achieving sustainable urban development. The Caribbean has had a long urban history, yet urban management has not played a significant role in guiding development. Limited resources make future planning imperative in the region and urban form is being explored as an option. Increasing urban populations coupled with the peculiarities of the Caribbean urbanisation process, leave governments and policy makers grappling with how to manage and guide future urban development in a sustainable manner. Will urban form either through compaction or decentralisation be the way forward?

Keywords: sustainable urbanisation, Caribbean, urban form, development

1.0 Introduction

Current statistics by the United Nations (UN), show that the Caribbean is one of the most highly urbanised regions in the world, with 66.2 percent of its population living in urban settlements (UN, 2011) – a proportion almost twice as high as those for Africa and Asia (39%). Yet, this data belies the popular representation of Caribbean life, a fact which may give insight into the low priority given to urban specific policies. With the exception of the larger cities - for example Port of Spain and Kingston – Caribbean urban environments do not discernibly represent severe environmental degradation (Heileman et al., 2003). Since urbanization and urban planning are not viewed as crucial issues, the consequence has been ineffective land use, culminating in the avoidable loss of valuable lands which could be used for other pressing environmental and social interventions (UNEP, 2003). Prior land use decisions, coupled with the continued growth of urban populations, have meant that environmentally sensitive and hazard-prone areas such as mangroves, hillsides and flood plains are increasingly being utilised for development.

Understanding the problems related to urbanisation in the region however, is a less complicated enterprise than finding solutions. Historical, physical and contemporary forces - which have shaped Caribbean urban development - only add to the complexities of managing the urban sphere. While several publications have addressed the urban issues of Latin America and the Caribbean (LAC) collectively (e.g. UN-Habitat, 2009, 2012), according to Potter (1989), literature covering the related issues of urbanisation, territorial planning and development options specific to the Caribbean region is limited. As Portes et al. (1997) state, generalisations about urbanisation in LAC have been mainly based on the experience of the larger countries and applied by extension to smaller ones. Hence, urban trends and projections for the LAC aggregate will naturally mask considerable regional diversity (e.g. Beall et al. 2010). Although common features can be observed such as urban primacy and large urban populations, variations will be reflected in both the *nature of* and *response to* urbanisation and its problems (Drakakis-Smith, 1995). The negative impact of non-indigenous solutions is highlighted in the document by UN-Habitat (2002) 'Sustainable Urbanisation: Bridging the green and brown agenda', which states:

"..... the current situation in developing countries has its roots in a history of urban development which has frequently been characterised by inappropriate policy. Early attempts in replicating the approaches and solutions developed by the urban agenda in developed countries were ineffective at best and counter-productive at worst"

Caution must therefore be exercised before policies that were created *by* and *for* other regions are adopted. As part of the effort to address urban problems, the region has already been looking to internationally formulated models. One such model is that of the 'compact city'. Internationally, the compact city has almost become synonymous with sustainable urbanisation, yet the arguments raised by the imperative of sustainable development in *developed* versus *developing* countries highlights the issue of transferability. This challenges the viability of the compact city model in achieving the goals of sustainability in the Caribbean context. The paper first addresses the meaning of sustainable urbanisation and the ongoing debate concerning compact city form as a response mechanism, drawing parallels between the sustainability goals in cities of the developed nations versus the Caribbean.

2.0. Sustainable Development and Sustainable Urbanisation

Sustainable urbanisation principles find their genesis in the concept of sustainable development, a term fist popularised by the Brundtland Report. The report defined sustainable development as ".....development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). While most agreed that sustainable development was a noble and necessary objective, it was the source of much global debate about the sustainability of the world's environment and economy. Today we understand sustainable development to be the convergence of the goals of environmental preservation, economic growth and social equity; however, the concept still remains elusive. The constraints and contradictions of the premise become quite apparent when attempting to move from theory to practice (Mitlin and Satterthwaite, 1996). Some of the main issues include (1) the continued dominance of economic growth over environment and society (Giddings et al., 2002), (2) the significance of individual responsibility i.e. the impact of lifestyle, consumption and behaviour (Spaargaren et al, 2000), (3) equating 'development' with economic growth (Purvis et al, 2013), (4) avoidance of the questions of power, exploitation and even redistribution (Robinson et al., 2004). While we could go on, the goal here is not to enter into the debate on sustainable development but to highlight the difficulties in operationalising the concept. As we will show, much of the contention surrounding sustainable development has pervaded the discussion on sustainable urbanisation.

2.1. Urban Form and Sustainability

Given the premise that there is a strong correlation between land use characteristics and consumption, it is expected that urban form would become a focus for urban sustainability. As with the discourse on sustainable development, consensus on the need to promote sustainable cities is underlain by significant differences regarding what urban sustainability means and how to promote it. Central to the debate is how cities should be developed in the future, and what effects, if any, does form have on resource use and social and economic sustainability. The relationship between form and sustainability is therefore a contentious one. According to Brehney in Jenks (1996), the scope of the debate is heavily polarised between those who favour decentralisation and those who believe in the virtues of high density. The compact city is viewed as the antithesis to the current 'sprawling' development patterns which are deemed unsustainable. The vast literature on urban form however, shows the debate is tending to favour

heavily one solution i.e. the compact city, though questions as to how compact is sustainable and how sustainable is compact have yet to be answered.

Compaction vs. Sprawl

Urban sprawl as defined by Nelson et al. (1995) is: "...low density, mismanaged, and uncoordinated single use development that does not provide for a functional mix of uses and/or is not functionally related to surrounding land use". This type of development tends to be characterised by automobile dependence, excessive land consumption, congestion, socioeconomic segregation due to exclusionary housing markets and significant infrastructure provision costs (see Carruthers and Ulfarsson, 2002; Burchell and Mukhrji, 2003; Sturm and Cohen, 2004). Bruegmann (2006) however, contends that sprawl is not an "aberration in history but the norm", stating that throughout history high density was almost always considered "the great urban evil". This reveals what Neuman (2005) refers to as the 'paradox' between urban desirability (compaction) and suburban liveability (sprawl). In many cases, sprawl has been encouraged with support from public financing of infrastructure to service the developments of mortgage subsidies to promote homeownership. The attractiveness of 'suburbia' is therefore undeniable and one of the main criticisms lay against supporters of compact city development with regards to quality of life.

According to Scheurer (2001), "the compact city paradigm seems strangely out of tune with the realities and the momentum of everyday life within sprawl". It is a habitat of adequate extent to be of central importance for the future of cities and though condemned by compaction theorists, it is unlikely that sprawl will cease to exist. So strong is the draw of suburbia that according to Blowers in Breheny (1992) "people will be prepared to put up with a great deal more congestion, pollution and general environmental deterioration, so long as they continue to enjoy the freedom and comforts of modern consumerist society". This has led many to believe that a compromise position is required which balances the benefits of urban desirability with suburban liveability (Breheny in Jenks, 1996).

But what, if any, are the benefits offered by more compact models of development? While the compact city has practically become the synonym for the sustainable city, what exactly is it? Despite the terms common usage, there is little by way of a working definition, making differentiations between what *is* and what *is not* compact urban form difficult. Density, though one of the main features, is quite insufficient in describing the compact city (Burton, 2002). Further refinement of the concept has been advanced through practice and research (e.g. Elkin et al., 1991; Goodchild, 1994; Williams et al., 1996; Burton, 2000) to include characteristics such as mixture of land uses, residential density and transport infrastructure. Though not exhaustive, Figure 1 lists some of the characteristics required for compact city development. Essentially this type of development is intended to: be more energy efficient - particularly in the area of transport, conserve land resources, reduce infrastructure costs, reduce greenhouse gas emissions and improve the general quality of life. Conceptually, compact cities make sense, if 'sprawl' is bad then 'compact' must be good? The ideal has given way to reality in terms of whether intensification can actually deliver on its promises of a more sustainable urban future.
Many of the claims made in support of compaction have been proven through practice, to fall short of expectations. Testing the relationship between certain indicators of urban form to selected environmental variables has been inconsistent and oftentimes contradictory (Crane, 2000; Hall, 2001). This has led several researchers to argue that associations previously assumed to exist between urban form and a number of sustainability benefits were either unsubstantiated by fact or dependent on a range of intervening variables – some of which were far more significant than urban form (Williams et al., 2000). For example, the scientific case for

Compact city characteristics.

1. High residential and employment densities
2. Mixture of land uses
3. Fine grain of land uses (proximity of varied uses and small relative size of land parcels)
4. Increased social and economic interactions
5. Contiguous development (some parcels or structures may be vacant or abandoned or surface parking)
6. Contained urban development, demarcated by legible limits
7. Urban infrastructure, especially sewerage and water mains
8. Multimodal transportation
9. High degrees of accessibility: local/regional
10. High degrees of street connectivity (internal/external), including sidewalks and bicycle lanes
11. High degree of impervious surface coverage
12. Low open-space ratio
13. Unitary control of planning of land development, or closely coordinated control
14. Sufficient government fiscal capacity to finance urban facilities and infrastructure

Figure 1: *Compact City Characteristics*
Source: *Newman, 2005*

compact cities has been centred on the supposedly lower levels of travel and hence lower levels of fuel consumption and emissions associated with higher densities. Yet, Hall (2001) propose that travel had a much stronger relationship to fuel prices and income than density.

The fatal flaw is the reductionist view that compact city proponents have of urban areas. As Durack (2001) asserts "...science has discovered that we cannot understand the world by reducing it to its constituent parts and examining the laws under which these parts behave". Despite the challenges concerning 'burden of proof' the main concern is whether or not the 'compact city' is actually sustainable. According to Newman (2005), "preliminary evidence testing the compact city with regard to sustainability suggests that the relationship can be negatively correlated, weakly related, or correlated in limited ways'. This idea of sustainability and the compact city is explored by Burton (2000) and Hofstad (2012). Burton (2000), in a review of twenty five English cities, found that social equity – as measured by forty four indicators – had a mostly negative relation with compactness. Hofstad (2012) on the other hand, assessed the economic, environmental and social goals linked to densification and mixed use development in four Scandinavian countries. Through this research, it was evident that *economic* considerations "enjoyed the more favourable position", while social and environmental goals had a low level of impact on real planning outcomes.

Based on the ongoing discussion, claims for the compact city are neither self evident nor as yet convincing as concluded by Welbank in Jenks (1996). Nevertheless, these critiques of the compact city model do not advocate for a return or continuation of sprawl, but shows that "all hope of achieving sustainable urban form should not be pinned on just one option" (Williams et al., 2000). That being said, Thomas and Cousins (2000) propose that *any* future urban development form will need to address the issues of: accommodating growth, energy consumption, accessibility, economic viability, ecological integration and protection, political achievability, popular aspirations of quality of life and the burden of proof of success. Any changes in the built-environment are a major, costly undertaking and should not be performed without a deeper assessment of the forces driving changes at the urban level.

3.0. The Caribbean Urban Experience

Contrary to the stereotypical representations of the Caribbean with their miles of white sandy beaches and warm tropical breezes, the region has had a long and distinctive urban history. Since the 1950s the level of urbanisation in the Caribbean was already exceptionally high, with 35 percent of its population living in urban areas. By 1970, the figure rose to 45.6 percent and as of 2010 urban population has increased significantly to 67 percent (UN, 2011). Interestingly, Table 1 shows that Caribbean urbanisation levels have exceeded those of the world in aggregate, keeping pace with the More Developed Regions (MDR) as well.

Table 1. Comparative levels of urbanisation in the Caribbean, 1950 - 2011

Year	Total population of the Caribbean living in town and cities (thousands)	Total MDR population living in town and cities (thousands)	Percentage of total population living in urban areas		
			Caribbean	World	MDR
1950	6 301	441 845	36.9	29.4	54.5
1970	11 537	670 573	45.6	36.6	66.6
2011	28 106	964 240	67.0	52.1	77.7

Source: *UN World Urbanisation Prospects (2011)*

Despite these surprising statistics, Caribbean cities and their *process* of urbanisation are considered an underexposed phenomenon (Jaffe, 2008). Very little has been published in relation to issues of urbanisation, territorial planning and development options specific to the Caribbean region (Potter, 1989). The study of Caribbean cities is essentially a study in the effects of globalisation, regarding its economy, polity and society. According to Mintz (1971), as the first part of the non-Western world to endure an era of intensive Westernising activity, the Caribbean became 'modern' in some ways even before Europe itself.

3.1. The 'Urban Bias'

The urbanised nature of Caribbean nations has its genesis in the mercantile and colonial eras, where the form and function of Caribbean cities, articulated in their spatial, social and economic features, are rooted in that history. This legacy is apparent in the form of dependent urbanisation, the realities of which are clearly expressed in the highly skewed and spatially uneven settlement patterns found throughout the region (Potter, 1989). Colonial settlements normally proceeded through one – or in some instances a limited number of - coastal gateways. These port cities were not created as centres of industrial development but primarily served as points of administrative, commercial, political control and points of extraction. However, the global flows and colonial powers that shaped the Caribbean in the past are continued in the form of present-day dependencies. The post independence era saw the newly independent territories seeking prosperity and ultimately "equating the state of development with the process of urbanisation and industrialisation" (Potter, 1989). Economic development in sectors such as tourism, manufacturing, service and industry resulted in further intensification of infrastructure expansion within cities and coastal areas. This in turn makes the capital city even more attractive for future growth. As Potter (1989) states "...the geographic pull of accessible and previously well developed sites with good infrastructural facilities for industry and of safe scenic beaches with regard to tourism, have served to skew recent developments to those very same coastal locations that centuries earlier had first attracted mercantile capital".

The pull of the city is evident in the proliferation of urban primacy throughout the region. Urban primacy – the percentage or share of national population living in the largest city or town - is a characteristic of urbanisation in the Caribbean (see Fig. 2). In the smaller Caribbean island nations this could not be otherwise, because their size prevents the existence of many secondary cities and, hence, the development of a sizeable urban system (Portes et al., 1997). In more recent times, the physical expansion of cities and economic development have led to the emergence of new urban expressions across the region and established phenomena such as conurbations, metropolitan areas, and urban development corridors for example POS in Trinidad, Bridgetown in Barbados, Castries in St. Lucia and New Kingston in Jamaica (Ransawak et al., 2005)

Typically the Caribbean primate city tends to attract to itself a disproportionately large share of the island's wealth, political power, professional talent, skilled labour, health, education, and other social services. Reinforcing this primacy is the policies of past and present governments in combination with the centripetal agglomeration effect of market forces. This skewing of resources towards urban sectors has been done at the expense of rural development. As Cross (1979) so pertinently conveys, "People have been prised from the land by the impossibility of making an adequate income and weaned from it by education that has effectively denigrated agricultural employment". This has caused the agricultural sector to be relegated to insignificance in many islands, a factor which may potentially explain the continued annihilation of prime agricultural lands for housing and other types of development. Considering all these factors the ultimate concern is whether this form of development is environmentally and socially sustainable in the future.

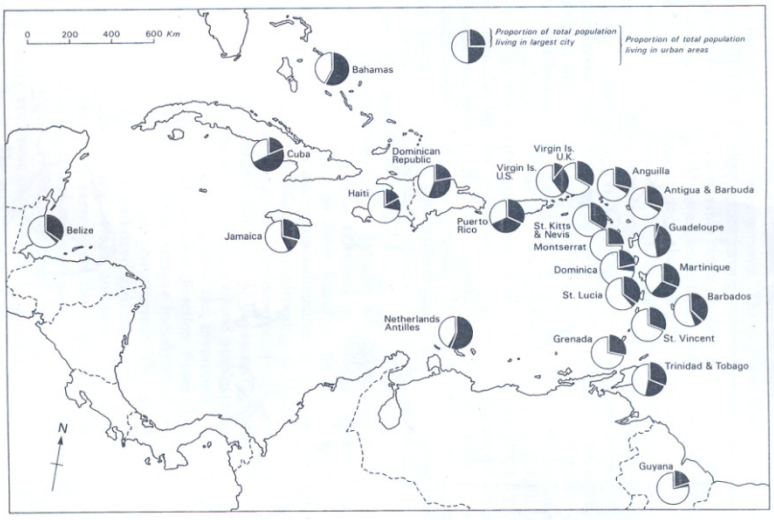

***Figure 1**: Levels of urbanisation and urban primacy in the Caribbean*
Source: Potter (1989)

3.2. Urban sustainability in the Caribbean

Despite its highly urbanised character, urban settlements are hardly on the Caribbean development agenda. While the region understands the sustainability issues being experienced locally, it has been more of a debate concerning a development agenda as opposed to an urban development agenda. Most of the research and documentation concerning urban sustainability in the Caribbean is largely driven by international organisations such as the United Nations and the World Bank. However, several problems arise in analysing the data presented. First is the issue of the LAC aggregate, generalisations about urbanisation in this grouping tend to be based on the experience of the larger countries (e.g. Mexico and Brazil) and applied by extension to the smaller ones (Portes et al., 1997). Hence, urban trends and projections for the LAC aggregate will naturally mask considerable regional diversity (e.g. Beall et al. 2010), making the information less useful for understanding the Caribbean context. Second is the very definition of urban areas. The data used in urbanisation reviews do not relate to the *process* of urbanisation but to urban population growth, the latter being a function of the respective governments' definition of 'urban'. The implications of the range of definitions for urban areas can be seen in the array of populations and areas attributed to selected Caribbean Islands. For example statistics for Anguilla – based on a lack of available data - state that the island is 100% urban, however this represents a population of 12,000 while the total land area is 90km^2. This statistic does not infer any spatial information that may be of use in understanding urbanisation in the Island.

Steps however, have been taken to focus on the issues of the Caribbean region. Within the United Nations, the Small Islands Development States (SIDS)-Unit, located within the Division of Economic and Social Affairs (DESA), is exclusively engaged with the region. Two core documents form the basis of their work: the Barbados Program of Action (BPOA, signed 1994)

and the Mauritius Strategy for the Implementation of the BPOA. Still, neither of these documents focuses specifically on urban issues nor do they often make reference to urban specific policies. Despite these limitations we can still attempt to extrapolate the issues which affect the sustainability of urban areas and by extension national sustainability. The following table gives a summary of the main challenges facing future urban management within the Caribbean region. It can be observed that the most obvious challenge that islands have to endure relates to their geographic limitations of small size and isolation, as well as the acute external economic orientation. In the case of the Caribbean size matters. It influences every aspect of development in some way, hence, the major long-term land management issue in most islands is to balance economic growth with conservation of limited land space.

Table 2: Challenges to Urban Sustainability in the Region

Factor	Challenge to urban sustainability
Small Size	Limited space for expansion High competition between land uses Immediacy of interdependence in human-environment systems (provisioning services) Limited Resource base
Physical	Limited developable land (topographic constraints) Increased cost of infrastructure provision Low lying coastal zone Susceptibility to natural hazards (hurricanes/earthquakes/volcanic eruptions)
Demographic factors	Limited human resource base Small populations High urban growth rate Urban primacy Concentration of population in coastal zone Dis-economies of scale leading to high per capita costs for infrastructure and services Mobility explosion
Economic Factors	Small economies; limited fiscal base Dependence on external finance Growing middle class Dependence on natural resources for economic development High specialisation of production High dependence on energy imports

Source: adapted from sources: Pelling and Uitto (2001), Lockhart et al. (1993), Conway (1998), Armstrong and Read (2006) and Slade (1999)

Albeit, if the current urban development trajectory continues, it serves to undermine any potential rewards made in other conservation policy areas. Rapid, unplanned and uncontrolled urban growth has characterised Caribbean towns and cities since the 1960s (Barker in Palmié et al. 2011) resulting in urban sprawl, inadequate housing in inner cities and squatter settlement in vacant and often hazard prone areas. The general dominance of decentralisation trends have been effected by both private and public enterprise. According to UN-Habitat (2009), "permissive land-use planning and the growth of affluent populations have facilitated urban sprawl, which in turn has contributed to the number of cars, distances travelled, length of paved roads, fuel consumption, and alteration of ecological systems". For example Table 3 shows the vehicle ownership and associated road network for a sample of Islands. Interestingly, out of a list of 167 countries St. Kitts and Nevis, Barbados, St. Lucia, Dominica and Trinidad and Tobago ranked 39th, 42nd, 47th, 48th and 51st respectively. Based on local studies however, these values may be significantly higher, recent statistics for Trinidad and Tobago show that while the annual population growth is of the order of 6,500 to 8,500 persons, the annual rate of growth for private cars is currently about twice the national population growth (Newsday, 2012). This means car numbers are increasing more rapidly than population.

Table 3: Upper Middle Income countries

Country	Total Land Area (sqkm)	GDP Per Capita (constant 1995 US$)	Vehicle ownership (per 100ppl)	Gas Prices (US$ per litre)	Paved Roads (km)	Highways (km)
Barbados	430	8610	188	$1.00	1600	1793
St Kitts and Nevis	360	6535	223	$3.27	163	320
St Lucia	620	3771	166	$1.26	48	1210
Dominica	750	3291	163	$1.40	393	12,600
Trinidad and Tobago	5130	5553	151	$0.36	4,252	8320

Source: *CIA factbook*

This trend has significant consequences for both the energy and infrastructure sectors. The main issue here, is that Caribbean countries are heavily dependent on fossil fuels. Up to 50% of their export earnings, including revenues from tourism, are spent to import oil products. Economic growth and increased energy demand are closely linked, Figure 3 shows that economic development contracts as a result of higher oil prices. In Barbados, the two largest consumers of imported fuel are electricity generation at 50% and transportation at over 30%, where electricity generation accounts for 74% of all CO_2 emitted by the country and transport contributing 14% (European Commission, 2006). Despite this, the Caribbean is considered a very low emitter of CO_2. The annual CO_2 emissions per country table, lists the Caribbean at 0.3% of the total carbon emissions worldwide. However, when emissions from land use change are taken into account, the results are slightly higher (UNEP, 2001).

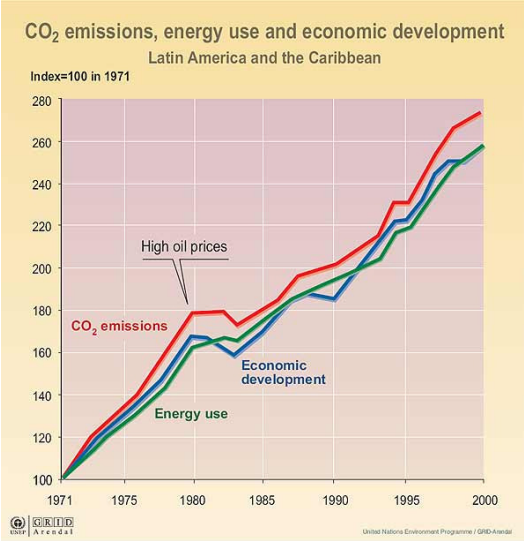

Figure 3*: energy use and economic development*
Source: *World Resources Institute*

Fuel imports represent approximately 21% of the regions GDP, a figure which is almost four times the cost of food imports, such large expenditure on fuel leaves little for investment in other key development areas (CNULM, 2012). On average the region spends less than 2% of GDP on infrastructure, while 3-6% is needed to simply catch up with urbanisation and population levels (Fay et al., 2007). Essentially governments are the main providers of major infrastructural projects in the region, with little input from private enterprise. This general dependence on the 'public purse' means that resources are stretched to their limits, a fact particularly evident in the housing sector. The region has continued to grapple with the issue of affordable housing provision to meet the needs of the population. According to Rambarran (2013), in Trinidad and Tobago, the median price for a 3-bedroom house (with land) increased from TT$237,770 (US$36,920) in 1993 (when the economy had stabilized after almost a decade of negative growth) to TT$721,481 (US$112,031) in 2003 just before the economy was about to experience its third energy boom. At the end of September 2012, the median price for a 3-bedroom house jumped to TT$1.0 million (US$155,279). The search for solutions to housing shortages –by both private and public entities - has led to the acceleration of urban sprawl, as low-priced undeveloped sites, particularly agricultural sites, on the periphery of urban areas are being acquired for housing developments.

In spite of these limitations, there have been major improvements in access to water, health, education, sanitation, electricity, income, telecommunications, ports and airports. Based on data from the UNDP Human Development Index (HDI) the Caribbean countries fall within the Very High Human Development countries (Barbados), High Human Development countries (Antigua and Barbuda, Bahamas, Belize, Dominica, Grenada, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines and Trinidad and Tobago) and Medium Human Development countries (Guyana and Suriname). The question now is what does all this mean for future urban development?

3.3. The Urban Sustainability Challenge: Is Compact Urban Form an option?

While the dominant motive behind the sustainability imperative is global warming and hence the reduction in greenhouse gases, the Caribbean is a low emitter of carbon and is more concerned with other priority areas such as impacts of climate change, economic growth, energy costs and retaining the provisioning function of natural areas. Most of the challenges are consumption-related and are linked to demands on key resources such as land, water, energy and food security. Data presented in the previous sections show that the region already features many of the problems experienced by more developed countries, however, limitations due to sheer size, capacity and resources in light of rapid population and economic growth make the search for solutions critical (Gakenheimer, 1999). Given the regions sustainability goals can compact urban form be seen as an entry point to more sustainable urbanisation? While many of the benefits attributed to compact city development converge with the sustainability goals of the region at certain points they also diverge at others. From the research it is evident there are three major obstacles to the implementation of compact city form (1) Data Availability (2) Geography and Climate and (3) Feasibility.

It became obvious during the course of this research that very little urban data exists for the region. Several documents touch on urbanisation as a root cause of ongoing environmental degradation, but little has been done by way of analysing the very nature of the urban development that is currently taking place. Pertinent information required to make decisions concerning urban sustainability is absent. Knowledge of urban densities, how the city functions, transport systems, distribution of land uses, the urban morphology and how exactly energy is being utilised are significant contributors to understanding the links between urban land use and resource consumption. Given the distinct physical and geographic characteristics of the Caribbean, data scarcity proves to be even more critical to achieving sustainable urban development.

Population densities for the Caribbean are relatively high - a function of both limited developable land and small size. For comparison's sake, the entire island of Anguilla is 134 sq km (52 square miles) the size of Washington, D.C and Barbados has a population density of 621 persons per sq km, twice the population density of the United Kingdom and three times that of Japan. It therefore seems like a contradiction to define development as low density or sprawl. So at what point do we call city expansion sprawl? The problems lie more in the pattern of development along coastal strips and consumption of ecologically sensitive and productive areas. Approximately 60% of the Caribbean's population already lives within 1.5 km of the coast where the risk of submergence, flooding and storm surges is heightened (Simpson et al, 2010). Any intensification of development within these cities would therefore place more people and critical infrastructure into already vulnerable locations. Climate Change adaptation is essential for future urban development, yet little is mentioned within the compact city discourse concerning building resilience to the impacts of climate change. Failure to adapt to climate change could cost an estimated average of 5% of 2004 GDP across the Caribbean by 2025. Predicted costs rise

to as much as 75% by 2100 for smaller nations. Other interventions such as building design and green infrastructure measures may prove to be more implementable and economically viable options.

As discussed earlier any development options are based on economic objectives. In the Caribbean context economic growth and energy demands are tightly linked. Energy has become central to the Caribbean region's existence. The Electricity and transportation sectors are the two most prevalent applications. Necessity, convenience and luxury have been the drivers of this dependency that does not seem to subside, even in the face of global climate change (ECLAC, 2009). The main issue with regards to energy is not necessarily emissions but rather the high cost of import. While densification and intensification may bring marginal benefit, greater benefits would be gained from utilizing alternative energy sources such as wind, solar and hydro power. While the provision of combined heat and power (CHP) is a selling point for the compact city, the Caribbean does not require heating but rather cooling, and denser development leads to higher cooling costs due to the Urban Heat Island effect. It is also suggested that urban form may do little in terms of the mobility explosion occurring in the region. The Central Business Districts of many islands are in decline, loosing residential populations, yet, due to urban primacy, they maintain large transient populations accessing employment and other services. Therefore decentralisation of these activities to other peripheral concentration nodes may prove more beneficial than increasing residential densities within the city. Other factors such as climate, lifestyle and gas prices may also influence the applicability of other transport modes such as walking and bicycling.

Policies which affect land use are also inextricably bound with overall strategies of economic development and thus by extension to societal and political goals. The enormous debt burden of many islands – which already severely hampers their development options – limits their capacity to invest in the urban sector. In the face of scarce economic and financial resources, short government term-limits, and fragmented political publics, some governments make decisions which may provide short term benefits with negative long term effects. Overall there seems to be a general lack of commitment to sustainable development objectives. For example while theoretically there has been a commitment by governments of the region to the principles of sustainable development (e.g. BPOA, MDG), the implementation of the BPOA had fallen short of expectations and has yielded considerably fewer concrete results than were anticipated (UNEP 2003). One reason for this according to Williams (2003) is that in many islands bureaucratic infighting and passive resistance often lead to paralysis and an inability to take any action towards sustainable development imperatives. While urban planning is viewed as the mechanism for managing land use, it is a slow and protracted process in many of the islands. In many instances notwithstanding the resources, finances and time in preparation of development plans and legislation, there is perceived to be a general malaise with regard to implementation of projects and adoption of many polices.

4. Conclusion

Planners in rapidly urbanizing regions in the Caribbean are under immense pressure to address urban issues and thus they often propose short sighted planning measures. The multitude of pressing problems that confront the region—such as informal settlements, environmental degradation, resource exhaustion, and underdeveloped infrastructure—necessitate immediate attention by planners. However, it becomes difficult to advocate for *any* type of sustainable urban form, compact or otherwise, with limited supporting documentation and a general lack of research on urban areas. Population statistics convey little of the social, political, economic, and demographic changes which predicate the increasing trend towards urbanisation. It would

therefore be imprudent to attempt to advance simply by translating a few physical continental solutions to the Caribbean. While a level of compaction is desirable, there are many other factors which need to be assessed. Therefore, increasing the scope of national assessments to include the urban sector with regards to the relationships between urban densities, city functions, transport systems, urban hazard vulnerability, urban morphology and energy use will allow planners to leverage government support for a more sustainable city form.

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