

Sustainable Urbanisation in Africa

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Abstract

Taking Angola as an example the paper offers an insight into how the issue of dramatic housing shortages and population density imbalance across African countries, that frequently result from prolonged civil wars, is being addressed. Some of these efforts, by and large driven by populist political expediency, are misguided and likely to lead to long term socio-economic problems. Many new towns and cities created through this process are far from being resilient or smart. They merely provide statistical data as to the number of units created, and have no regard for living conditions and social cohesion in the long run, or the life-time viability of what has been built. The 27-year Angolan civil war, ended in 2002, led to the destruction of most of the country's infrastructure and resulted in a major housing crisis, especially in the capital Luanda, where 21% of the country's population lives at present. The Angolan government is engaged in a program aimed at decentralising the population. This involves creating new towns and settlements, new road networks etc. Most of large volume housing built at present in Angola is built by Chinese entities and mimicking the Hong-Kong/China high-rise, which is inappropriate for the climatic and socioeconomic reality of Angola. These are normally bedroom estates i.e. not fully functional multifaceted urban organisms. The paper presents also examples of sustainable urban projects by Studio Bednarski, in Africa, Cuba and Europe as well as a set of rules that must be considered when projects of this nature are developed.

Keywards: Urbanisation, Housing, Population Growth, Social Resilience, Decision Making Competence, Design Competence, Cultural and Climatic Appropriateness, Town, Cities

1 Introduction

Population growth is closely linked to growing urbanisation, and rapid urbanisation is one of the current megatrends. Provision of adequate housing constitutes one of the biggest challenges for all countries, from the likes of the UK to the poorest nations. A challenge that is highly political and affects slum dwellers in the developing world as well as middle-income households in expensive global cities. Hundreds of millions of people struggle to find decent housing that is affordable without crippling financial commitments. The economic, societal and human impact of lack of affordable housing is enormous. McKinsey Global Institute in its October 2014 Report -A Blueprint for Addressing the Global Affordable Housing Challenge, estimated that "some 330 million households are affected around the world and, under current trends, by 2025 the number of households that occupy unsafe or inadequate housing, or are financially stretched by housing costs could reach 440 million - or 1.6 billion people." By 2025 there will be some 40 cities with population larger than 10 million. The global rise of cities has been unprecedented. In 1800, 2% of the world's population lived in cities. Now it's 50%. Cities occupy 0.5% of the world's surface, but consume 75% of its resources. Every week, some 1.5 million new people join the population of cities , through a combination of migration and childbirth. The numbers living in urban slums have risen by a third since 1990. Over the next decade, New York, Beijing, Shanghai and London alone will need US\$8 trillion in infrastructure investments.

2. Urbanisation in Angola

Angola's land area at 1,246,700 km² is twice the size of France, and its population count according to a 2014 census is presently standing at 24,383,301. Angola's population density is thus 14.8/km² which makes it 199 lowest in the world. Prior to his re-election in 2008, President Eduardo dos Santos pledged to build '1 million homes'. The original plan was to build 685,000 homes as selfbuilt, 185,000 by the government, 120,000 by the private sector, and 80,000 by housing cooperatives. Gabinete de Reconstrução Nacional, which falls under the Presidency, is in charge of Angola's key infrastructure projects including the new international airport and three railway lines, as well as the '1 million homes' programme. A total of 100 000 hectares of land around Luanda, Benguela, Namibe, Lubango and Malange has been earmarked for the programme, which involves satellite towns, called 'new centres' (novas centralidades) or 'new cities' (novas cidades). Five satellite towns near Luanda and the majority of those being built in the provinces are constructed by Chinese state-owned companies and their Chinese subcontractors. These satellite towns and other infrastructure projects are financed by Chinese oil-backed loans, either under China – Angola bilateral agreements or through private contracts. It would be interesting to observe how the hard currency difficulties suffered by Angola as a result of low crude oil prices impact on the urbanisation of the country.

2.1 Kilamba

Kilamba Kiaxi is a component of that presidential promise. This \$3.5 billion project, a mega satellite town being built 20 km from Luanda's centre, is a flagship housing project for both China and Angola. It is the biggest project thus far built by the Chinese outside of China. 710 buildings with 20,000 apartments were completed by September 2012, when the project hit the media as a 'Ghost Town'. 3.3 million m2 built in the first phase is spread over 5 km2. It is divided into 28 urban blocks of about 16 hectares each set on a rectilinear grid. There are three types of apartments in three types of buildings ranging from 5 to 11 storeys. The project includes also 24 kindergartens, 9 elementary schools and 8 middle schools, and supporting infrastructure consisting of 2 high voltage transformers, 77 power substations, 400 km of water pipes, a water sewage plant, traffic lights, and bus stops. The project is frequently presented to African leaders visiting Angola as a social housing model. The second phase currently underway consists of a further 5,000 housing units.



Figure 1. Kilamba

Initially Kilamba was to be financed by China International Fund (CIF), a private investment fund based in Hong Kong however in 2008, when CIF ran into financial difficulties, the project was taken over by CITIC Construction, a subsidiary of the state-owned CITIC Group, and financed by the Industrial and Commercial Bank of China. Payment of the Chinese loans bypasses the Angolan government, with the Chinese banks paying the CCFs in China directly. Repayment of the loans is guaranteed by oil sales to Unipec, the trading subsidiary of the Chinese oil firm Sinopec. Angolan oil is not used directly for loan repayments, but as the collateral for servicing the loans. Although this funding formula is not unique to China, the Chinese model is distinct in that it involves a 100% state financial circuit (from the lending institution and contractors to the off-taker).

2.2 Dundo

The town of Dundo, in north east province of Luanda Norte, near the Angolan border with the Democratic Republic of Congo, was founded near a site where diamonds were first discovered in 1912. Until 1980 the Dundo mines produced annually nearly 10 percent of the world's total output of gem-quality diamonds. The Dundo Social Housing is a new project built on 117 hectares of land, realised in two stages. It is to provide accommodation for some 30,000 residents. Construction begun in 2008 by the Chinese company Pan-China Construction Group Ltd for Sonangol Imobiliaria e Propriedades Lda (SONIP).



Figure 2. Dundo at street level



Figure 3. Dundo aerial shot

The project, of which about 1/3 has been realised, involves four basic types of residential buildings: 5, 9, 11 and 18 storeys high. In addition also a hospital and schools were built, as well as

infrastructure consisting of water supply system, sewerage network and sewerage treatment plant, roads, pavements and landscaping.

Alarmed by apparent structural issues emerging during construction, SONIP engaged UK engineering expertise to investigate. In the process also sewer issues were uncovered. The main structural issue seems to stem from the fact that Chinese design codes were used and that buildings designed for certain heights were 'extruded' to create higher structures.

2.3 Critical review of Kilmaba and Dundo projects

While poor design, low construction standards, and disproportionate cost of flats were the issues that hit the media and attracted significant public interest, the true problems are much more complex and not easily discernible by a lay person, and clearly out of the vision field of the decision making politicians. Put against sustainable urban design principia both Kilamba and Dundo housing schemes fail on practically all counts. Analysing just three key issues demonstrates how basic design faults with these two projects are very likely to lead to long term socio-economic problems.

2.3.1 High rise

Transplanting the Chinese high-rise residential model to a country with one of the lowest population densities on the planet and a society where all social interactions always took place at ground level, is misguided and clashes with the life style of the Angolans.



Figure 4. High-rise housing outside of Beijing

There are several issues of concern. At the basic practical level high rise relies on power for lifts

and air conditioning. Power outages are the norm in Angola and are likely to be so for years to come. How do aged residents and visitors, mothers with prams get home if living on the top floors of towers? Maintenance - if the accommodation was in houses, even vertically detached of, say, 4 storeys, the owners/residents could take care of their building themselves as all elements of the building could be reached. How do you repair a leaking window or a facade defect on 10th floor? Nobody will ever erect scaffolding to this height to deal with a leaking window. Thus deterioration will continue. This, as well as the need to maintain mechanical devices like lifts, translates into maintenance and ownership cost not affordable to a great proportion of the residents.

There is then the issue of the individual residents being prevented from deploying energy generating devices at their own cost and for their own use, like solar water heaters or Photovoltaic panels, which they could do on individual houses but not on high rise blocks.

The sheer concept of mass high rise here is damaging to social cohesion. There are numerous examples of houses built in Angola by property developers with fitted kitchens, where the kitchens are never used as home cooking takes place outside. How, for example, can this tradition be accommodated in a high rise block of flats ?

2.3.2 Urban site planning

Orientation – at this geographical location east and west sun penetrates deep into the flats, resulting in residents blacking out so oriented widows, electrical lights being put on, and heavy reliance on air conditioning, in a country where power outages are still the norm. Orientation of buildings in Kilamba and in Dundo is random and does not seem to have been guided by any environmental planning principia. Urban planning at Kilamba gives the impression of buildings being randomly thrown onto square patches, almost like dice, with no rhyme or reason, with no attempt at creating sense of urban environment, with no active frontages along streets to create urban street life. Another result of such random placing of buildings is the spatial confusion that it creates, making it difficult for the residents and even more so for visitors, to orient themselves.



Figure 5. Aerial view of Kilamba

Colour coding of buildings in Kilamba seems to be an attempt at softening this self-inflicted shortcoming. In cities crime control is best enacted through overlooking and visual control of street environments. When residents are out at work people working in the area in shops, offices etc provide the visual supervision. When these people go home the residents come back home and they deter crime by way of visual supervision. In monocultural environments such as the Kilamba and the Dundo bedroom estates such natural, cost free and organic crime prevention is not possible.



Figure 6. Kilamba at street level, note absence of active ground floor frontages



Figure 7. Kilamba 'colour coding'

These two master plans were drawn up by urban planning and design institutes based in China, which still use outdated social-realist concepts such as zoning, rather than mixing uses. In addition the large-scale urban blocks are bigger than European or African urban grids. According to available reports Angolan planners faced difficulties in convincing the Chinese design planners to design in harmony with the local context and traditions.

2.3.3 Location

Locating urban developments correctly is the most critical step in developing successful urban entities. Indeed. if the decision about development land location is wrong, urban and housing projects cannot succeed, no matter how well construction, operations, and financing are managed. Projects must be built where residents can reach jobs within reasonable commuting times, families have access to schools and vital services, and people can connect with the society around them. Both Kilamba and Dundo are in essence huge bedroom estates located long distance from work places. They are not 'cities'. This is detrimental not only to environmental protection, creating high levels of transport generated pollution, but more importantly to the social cohesion and family life of the residents. It can take 3 - 4 hours to get to work in Luanda from Kilamba. This means a 6 hour commute every day. How are parents to interact with children when they leave at 5:00 in the morning and come back at 9:00 at night? How are people to interact in a meaningful way with their spouses? This scenario is likely to lead to social problems in the long run.



Figure 8. Commuting from and to Kilamba

3. Eco Town planning as an alternative

Urban development patterns are a primary factor in setting out sustainable energy policies. Drawing from the Angolan National Adaptation Programme of Action (NAPA) under the UN Framework Convention on Climate Change (UNFCCC) 2011 and the ANGOLA'S NATIONAL COMMUNICATION TO THE UNFCCC, Angolan urban development proposals should be conceived as Energy and Resource Efficient Eco-Towns. The following aims should constitute VISION and FUNDAMENTALS for all urban development projects :

- 1. Model Development Sustainable Socially, Environmentally, Economically
- 2. Mixed Uses with Active Frontages, Landmarks, Vistas and Focal Points
- 3. Alignment with Forces of Nature
- 4. Extensive Planting and Creation of Bioactive Land as Part of Infrastructure
- 5. Creation of Recognisable Places and Legible Connections
- 6. Creation of Coherent Neighbourhoods with Local Character of Distinction
- 7. Scope for Coherent and Harmonious Future Expansion of the Plan

Studio Bednarski was commissioned to generate master plans for four new towns in Angola. The authorities will implement all infrastructure and lay out all construction plots, which will then be sold to developers, who will design and build buildings in accordance with an urban code developed by Studio Bednarski. These are the projects, all which were based on the seven principia listed above:

- Canhoca, Kwanza Norte Province, Cazengo County
- Bimbe, Huambo Province, Bailundo County
- Ngandavila, Calima, Huambo
- Quirima, Municipio do Cazengo, Provincia do Kwanza Norte



Figure 8. Bimbe Eco-Town functional analysis



Figure 9. Bimbe Eco-Town use matrix

3.1 Plot orientation

The street pattern of these master plans was oriented so as to enable east and west facades, which normally suffer from excessive solar gain, to be defensive, with no, or minimal, fenestration. The aim was to improve internal comfort in buildings and homes, while reducing the use of electricity for artificial lighting and cooling. North-South oriented buildings also facilitate easy installation of solar water heaters and, if economically viable in the local context, also Photovoltaic panels. Figure 10. Bimbe Eco-Town – active green spaces

3.2 Trees and landscaping

An urbanised environment creates its own microclimate and air temperatures in built up areas can be much higher than temperatures in the surrounding rural countryside. Urban design can have a significant impact on urban climate. Trees, green spaces and areas of water can significantly cool the built environment and save energy. It was the prerogative of these projects that semi-mature tree planting and landscaping was treated as a vital part of the initial enabling investment on a par with the road network and the network of utilities infrastructure. This covered tree planting to all streets, to recreation

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grounds, screen planting to the utilities infrastructure zone and to the roads. We proposed also that in order to set up the 'seeds of landscaping' for the private free-standing houses also these plots each received a minimum of 3 to 5 semi-mature trees per plot, the cost of which would be added to the sales prices of these plots.

3.3 Transport

Transport is a major contributor to air pollution and the main cause of accidents. While the land areas covered by these four master plans was too small for a dedicated local public transport network all of the areas within the plans can be reached by foot or bicycle, which shall be encouraged as the main means of transport locally.

4. Other Examples of Eco Urban Work by Studio Bednarski

4.1 Low Cost Housing, Community of Kariobangi South, Nairobi, Kenya





The project, with a total value of US\$ 8 million, involved master planning and building design, Working with the initially for 500 houses. Kariobangi community we developed a low cost house model based on a courtyard pattern and shared walls. Each house featured a street-side room, known as the 'Dollar Room', intended as a means of income generation through rent or employment. People of Kariobangi South, as is typical for global populations at the bottoms of the economic status, do not have the luxury of social security and such like, and have to daily rely on their quick wit and trading skills to sustain their existence. Providing them with a fixed place to trade from, would enable them to rise on the socio-economic ladder. This source of income

would enable the house owners to obtain low cost mortgages. Thus the physical design of the houses and their planning had far reaching social and economic implications for the owners.



Figure 12. Floor plan - 8 houses

The unique aspect of this part of Kariobangi, if compared with Kibera, believed to be one of the worse slums in Africa, is the fact that our 500 clients had title to the land that they occupied.



Figure 12. Elevations with owner's artwork

The project won the DESIGN FOR AN EMERGING WORLD - FUTURE COMMUNITIES PROJECT award at CITYSCAPE 2006 in Dubai. The international jury stated *"This apparently simple approach to creating a new environment for a poor community is in fact based on a sophisticated analysis"*. The project has also been shortlisted in the RIBA SUSTAINABLE COMMUNITY BY DESIGN competition and featured in a travelling RIBA exhibition. UN Habitat invited Studio Bednarski to present a talk on the project at the UH Habitat seat in Nairobi.

4.2 Experimental Affordable Housing, Lieusaint, Seine-et-Marne, France

The project involves master planning and design for 32 units on a 3500m2 suburban site near Paris. We were the winners of a 2005 Franco-British limited competition organised jointly by the

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French Ministry of Culture, Direction de l'Architecture et du Patrimoine and the Commission for Architecture and the Built Environment from the UK, both supported by their respective governments and committed to encouraging the highest standards of architecture.



Figure 13. Entrance to common 'corridors'

The competition format "Atelier de Definition" allowed the competitors and the client to establish a dialogue and inform the programme.



Figure 14. Concept cross section

Our proposal was pragmatic and our aim was to give people civilised places to live and to reduce the maintenance and management burden for the client. Cost effectiveness was the issue not cheapness. Strict environmental principia were followed including orientation of rooms and gardens, scope for the use of photovoltaic and the use of sustainable materials.



Figure 15. Completed project

4.3 Cost and Time Certain Housing System for Havana, Cuba

The project was commissioned by Glenview, a Havana based Cuban Private Facilitator for Habaguanex, a Cuban State Agency.



Figure 16. General view

Havana has many spectacular buildings and city blocks. These attract western investors and developers. The trouble was that even if the city authorities wanted to enter into JV development deals these buildings were normally densely inhabited. The obvious solution was to provide alternative housing for the residents and then to develop the buildings, but in Cuba it could take 5 years and longer to build a single block of flats. We have been asked to develop a cost and time certain system that could be offered to developers wishing to develop existing buildings in Havana. The system was based on steel frame construction, adjusted to cater for the local perceptions and pattern of behaviour (solid concrete floors, for example, sustain pouring of buckets of water to both clean and cool the floors, they also provide feeling of safety and solidity).



Figure 17. Typical floor plan

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The system drew from the Cuban vernacular and was designed to cater for the local life styles as well as to cope with typhoon winds, corrosive seashore environment, high UV content in the air and torrential down pours. The architectural expression was closely inspired by the Cuban architecture with verandas, strong colour articulation, shaded courtyards and cross ventilation as a low cost means to climate management. The first housing estate of 118 flats, with structural frame and all wall cladding shipped from Europe, was estimated at \$400 per m2 of building, inclusive of infrastructure works like services, roads and landscaping.

4.4 Lekki Foreshore Marina Island, Lagos, Nigeria



Figure 18. Bird's eye view

The project, developed for Lekki Beltway Concession Development Limited, involves the creation of a new 57 ha mixed-use island reclaimed in the Lagos Lagoon, intended to be self-sufficient by way of power generation, including wind power, water purification and sewage treatment. The masterplan based on ecological principia, with wind corridors, is oriented on the axis of the prevailing winds taking advantage of this traditional cooling technique. It features the first marina proposed for the Lagos Lagoon, which while still polluted is one of the main natural resources of Lagos and will be cleaned up. This will be a predominantly residential development accommodating some 2000 homes high value, including 104 detached houses with their rear gardens giving onto the Lagoon, or the marina. 166 terraced houses will have access to totally safe shared private gardens, along the Notting Hill model in London. 1600 apartments in terraced blocks of flats will have Lagoon views, give onto a Central Park and have publically accessible services, shops etc on the ground and first floor.



Figure 19. Island plan with land use code

More than half of the island's waterfront will be open to public use as a promenade. The 10.5km eight-lane Lekki Beltway Bridge, also designed by Studio Bednarski, will pass by the south-western tip of the island.

5. Conclusions

Large-scale urban projects on the scale of Kilamba and Dundo could represent a component of a broader multifaceted strategy aimed at providing much needed housing for the emerging middle class in fast-developing African countries but the way in which they are procured, designed and delivered has to be reviewed and refined.

These two projects should be treated as a valuable learning opportunity not only for African urbanisation strategies but also for Chinese projects overseas. They could be used also as pointers for international aid providers involved in upgrading unplanned urban areas and with urban renewal. Many useful synergies could be derived from studying these projects to the benefit of African urbanisation needs, provided all stakeholder are recognised and willing to cooperate.

The critical areas for improvement include lifetime planning both in terms of economics as well social issues including:

- Cultural and climatic appropriates
- Appropriateness of scale
- Living towns and cities, with a mix of intertwined living, working, educational and cultural uses, not bedroom estates
- Firm and enforced environmental agendas and this includes encouraging and

empowering residents/owners to reduce use of grid energy through ease of installation of autonomous energy generating devices.

- Appropriate construction technologies, which facilitate also basic maintenance by the owners/users best placed to deal with minor repair issues as soon as they arise
- Empowerment of residents so that they can and are able to take ownership of the projects (according to the available data both Kilamba and Dundo were top-down projects imposed on the end users and in none of them the end users were offered any say in expressing their preferences at the initial brief, design or implementation stage)
- The cultural psychology of 'Ownership' must be taken into account. For most people Ownership starts at their home's front door, whether a house or a flat in high-rise. How this impacts on the treatment and care of common areas in high-rise blocks must be considered at design stage.
- All such projects should be seen as an opportunity to offer training ground for new advanced skills for the local people and should benefit the local economy not just remote entities, which in case of Kilamba and Dundo were Chinese entities.
- Transport and travel times for work education and culture must be at the forefront of the initial decision making at the stage of land identification for such projects. Long commuting times have severe detrimental impact on the health of family life and so by extension also on social cohesion.
- Quality urban design, architecture and functional internal layouts that are informed by and suited to the way of living of the future residents and users.
- Expert review process of design proposals before they are approved for construction. Such review panels should consist of architects, urban planners, civil, structural and environmental engineers as well as representative groups of end users.

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