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Article

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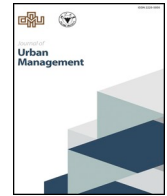
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Urban resilience – An urban management perspective

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ABSTRACT

This paper seeks to contribute to the increasingly pressing debate on urban resilience. It does so from an urban manager's perspective. It reviews three conceptual approaches to the subject. These are then set against current urban development programmes in Kenya. It suggests a three-stage set of interventions. In year one, the environmental and physical vulnerabilities are surveyed and plotted on maps. The ideal is through modern GIS. In year two, the softer side of the urban system gains more analytical credibility; the 'health and well-being' and 'economy and society' dimensions. Year three sees the consolidation of analysis and action through the vertically integrated and iterative spatial and policy-based budgeting processes. These are practical interpretations on how urban resilience might be put into practice. While the concept of urban resilience and practical advocacy centres on Kenya, its application can have resonance in other Africa countries.

Introduction

In 2017, the World Bank¹ published a report arguing, among other things that, 'cities in sub-Saharan Africa (SSA) are experiencing rapid population growth. Yet their economic growth has not kept pace. Why? One factor might be low capital investment, due in part to Africa's relative poverty'. The report goes on; 'Today, potential urban investors and entrepreneurs look at Africa and see crowded, disconnected, and costly cities.' If the city does not work efficiently in terms of spatial (land-use and design) form, supporting transportation and all the other external economies (water, sanitation, power), where is the incentive to invest? The disincentive is doubly so when one recognises the absence of urban resilience; collapsing buildings, when the rains are especially heavy. These challenges are compounded by Africa's rapid urbanisation.

Saghir and Santoro (2018)² present SSA's rapid urbanisation statistic. 'SSA is experiencing an annual urban population growth rate of 4.1 percent compared with a global rate of 2.0 percent.' Yet the 4.1 percent average belies the fact that 14 SSA countries have urban growth rates in excess of this, up to 5.7 percent. They move on to disaster risk and climate change. The urban failures to deal with this increasingly all-pervasive challenge is because basic services such as 'safe drinking water, proper sanitation, drainage and health care access' are wholly inadequate. This applies specifically to informal settlements where they state, 'As of 2014, 55 percent of the SSA urban population were living in slums'. The paper advocates strongly in favour of 'urban planning: the missing link in city resilience'. Town planning can make a significant contribution to urban resilience, as a mitigation to climate change. Environmental sieve and infrastructure threshold analysis is a start, introduced in the spatial analysis section.

In Kenya's cities and towns, when the heavy rains come, floods are reported, people drown, buildings collapse and others are

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¹ World Bank (2017). African cities: opening doors to the world. Washington DC.

² Saghir, J. and Santoro, J. (1998). Urbanisation in sub-Saharan Africa: Meeting Challenges by Bridging Stakeholders. Centre for Strategic and International Studies, Washington DC.

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killed by the feebly constructed bricks, mortar, concrete and poorly connected RSJs (rigid steel joists). Feeble construction even collapses without heavy rain; a school roof killing eight pupils and injuring scores more, in the week of September 22, 2019. This was not in an impoverished or informal settlement location but within comfortable walking distance of The Junction shopping mall and cinema complex; a development to Western standards. As the shock resonated, the same report stated that there is an estimated 40,000 buildings in Nairobi that have been constructed without planning approvals and building consents.³

In 2017, the Kenya Urban Programme (KenUP)⁴ stated that only about 30 percent of construction went through the official consent processes. The questions to be posed concern not only to understand the meaning of urban resilience but also, to introduce an approach to deal with the challenge. This paper seeks to answer both questions from a Kenyan perspective. It may also offer insights for hard-pressed city managers in other parts of rapidly urbanising Africa.

Section 1 reviews three concepts of urban resilience. Section 2 interprets all three in relation to current national urban development programmes, through the filter of urban management, in Kenya. The conclusion offers a three-stage approach to planning for urban resilience.

1. Urban resilience – the technical dimension

Three approaches to urban resilience are reviewed here. The first is from the UN Office of Disaster Risk Reduction. The second is from UN-Habitat. The last is from the Rockefeller Foundation.

1.1. UN office for disaster risk reduction (UNDRR)

The UNDRR text, *Making Cities Resilient*,⁵ offers a 10-point checklist at perhaps, a first analytical level. It is a ‘common-sense’ approach to planning for urban resilience (see Box 1).

This could be regarded as a very early, almost ‘conversational’, level of analysis; a ten-point agenda for an initial set of meetings. However, all 10 need to be considered more closely, from a practical city management perspective. Already, it becomes apparent that there are, in fact, two sets of interventions to build urban resilience but that they are mixed up. The first concerns physical and environmental matters; the second, institutional concerns. If this is accepted, the original ten points can be reorganised as follows:

Physical and environmental

4. Invest in and maintain critical infrastructure that reduces risk, such as flood drainage.
5. Assess the safety of all schools and health facilities and upgrade these as necessary.
6. Apply and enforce realistic, risk compliant building regulations and land use planning principles.
8. Protect ecosystems and natural buffers to mitigate floods, storm surges and other hazards.
10. Community organisations to design and help implement responses, including rebuilding homes and livelihoods.

Institutional concerns

1. Put in place organisation and coordination to understand and reduce disaster risk.
2. Assign a budget for disaster risk reduction and provide incentives.
3. Maintain up to date data on hazards and vulnerabilities.
7. Ensure that education programmes and training on disaster risk reduction are in place.
9. Install early warning systems and emergency management capacities in your city.

The first assertion is that the physical and environmental side is the initial point of resilient impact. In order to conduct an inventory of the physical and environmental assets and vulnerabilities, a geographical information system (GIS) is required. At its very basic, these are maps. More sophisticated city governments have and deploy cleverly, computer-based GIS. Once the vulnerabilities are identified, the institutional responses can follow.

The second assertion is that urban resilience cannot be considered organisationally, as a ‘line’ function, within any technical department. The institutional response has to be at a corporate – i.e. inter-departmental – level; a ‘staff’ function in organisational analysis. It therefore demands an integrated response at city government level. The mechanism for this is a city’s integrated development strategy. This is expanded upon later.

UN-Habitat has published *Trends in Urban Resilience* (2017).⁶ The Rockefeller Foundation and Arup have published *Measuring City Resilience* (2016).⁷ Both are considered below.

³ The Kenyan Daily Nation newspaper of 25 September 2019.

⁴ State Department of Housing and Urban Development, Urban Development Department, Nairobi, revised text, April 2018.

⁵ <https://www.unisdr.org/campaign/resilientcities/home/toolkitblkitem/?id=1> - accessed 3rd July 2019.

¹⁷ <https://www.unisdr.org/campaign/resilientcities/home/toolkitblkitem/?id=1> - accessed 3rd July 2019.

⁶ <https://unhabitat.org/books/trends-in-urban-resilience-2017/> - accessed 3rd July 2019.

⁷ <https://www.cityresilienceindex.org/#/and> <https://www.100resilientcities.org/tools/city-resilience-index/> - accessed 3rd July 2019.

Box 1The Ten Essentials for Making Cities Resilient Checklist Summary¹⁷

1. Put in place **organisation** and coordination to understand and reduce disaster risk, based on participation of citizen groups and civil society. Build local alliances. Ensure that all departments understand their role in disaster risk reduction and preparedness.
2. Assign a **budget** for disaster risk reduction and provide incentives for homeowners, low income families, communities, businesses and the public sector to invest in reducing the risks they face.
3. Maintain up to date **data** on hazards and vulnerabilities. Prepare risk assessments and use these as the basis for urban development plans and decisions, ensure that this information and the plans for your city's resilience are readily available to the public and fully discussed with them.
4. Invest in and maintain **critical infrastructure** that reduces risk, such as flood drainage, adjusted where needed to cope with climate change.
5. Assess the safety of all **schools** and **health facilities** and upgrade these as necessary.
6. Apply and enforce realistic, risk compliant **building regulations** and **land use planning** principles. Identify safe land for low income citizens and upgrade informal settlements, wherever feasible.
7. Ensure that **education** programmes and training on disaster risk reduction are in place in schools and local communities.
8. Protect **ecosystems and natural buffers** to mitigate floods, storm surges and other hazards to which your city may be vulnerable. Adapt to climate change by building on good risk reduction practices.
9. Install **early warning** systems and emergency management capacities in your city and hold regular public preparedness drills.
10. After any disaster, ensure that the needs of the affected population are placed at the centre of reconstruction, with support for them and their community organisations to design and help implement responses, including **rebuilding homes and livelihoods**.

1.2. UN habitat

The UN-Habitat document suggests that, ‘the traditional approach to urban resilience gives preference to the engineering resilience theory according to which, the resilience of a city is directly dependent on the capability of all the physical components of the system, including buildings and transportation infrastructures, to absorb the damages due to an external shock and to quickly restore their state before the shock’ (p.5). This is certainly a valid starting point and should not be discarded by more esoteric thinking. Indeed, the re-ordering of the initial 10-point checklist (above), starts with the ‘physical components of the system’.

The document goes on to suggest: ‘understanding that cities function as complex, interdependent and integrated social-ecological systems is crucial to understanding how resilience-based planning, development and management can protect life, assets and maintain continuity of functions through any plausible shock or stress. Programmes that deliver resilient healthcare, resilient water supply, resilient companies or resilience to climate change do not enhance a city's overall resilience when addressed separately’. This sector or silo approach is the Achilles' heel of the Smart and Resilient City concept. As a UN publication⁸ states: ‘in developing smart cities and infrastructure, an integrated approach should be adopted that will help break down silos that may exist between existing infrastructure verticals and between government departments that deal with related services’ (para. 43c).

To continue with UN Habitat: ‘only when viewing the system in its entirety, connected both within and beyond its boundaries, will cities be able to respond successfully to the impacts of economic, social, political or natural events and avoid displacement, inequity, overburdened urban services, or undermined capacity to properly manage cities.’(p.6). These items bring the argument down to the holistic urban management perspective, with an overwhelming urge to overcome the conventional silo thinking of specific sectors. Thus, it is viewing the city as an inter-connected system. These links are the key to understanding the dynamics within a city.⁹

The leader of the UN-Habitat publication offers a summation of the approach: ‘The definition that guides UN Habitat's Urban Resilience Programme reads as follows: “*Urban Resilience is the ability of any urban system to withstand and recover quickly from the impact of all plausible hazards, and maintain continuity of functions.*” This definition provides the starting point for developing metrics and diagnostic modelling, for identifying primary and secondary elements of (all) urban systems, as well as for designing indicators, analytics and sourcing validated data’. In essence, the message from both sources is that we should be viewing the challenge and responses from an urban ‘systems theory’ perspective. While this is correct (the holistic argument), his paper (and indeed, the cited UN-Habitat publication), does not offer a precise analytical framework. At this point therefore, while having sympathy for the urban system proposition, the original 10-point re-ordering holds sway: the physical-environmental conditions and the institutional responses to them. It is the Rockefeller-Arup publication that offers an analytical framework.

⁸ UN (2016). Smart cities and infrastructure, Report of the Secretary-General to the Commission on Science and Technology for Development, Geneva, E/CN.16/2016/2.

⁹ DFID's new African Cities Research Programme seeks to test the urban system's perspective: see McGill (2020) forthcoming, in the journal Town Planning Review.

Table 1
City RESILIENCE goals (indicators in Annex 1).

Health and well-being	
I	Minimal human vulnerability
II	Diverse livelihood & employment
III	Adequate safeguards to human life & health
Economy and society	
IV	Collective identity & mutual support
V	Social stability & security
VI	Economic security
Infrastructure and eco-systems	
VII	Reduced Physical Exposure & Vulnerability
VIII	Continuity of Critical Services
IX	Reliable communications & mobility
Leadership and strategy	
X	Effective leadership & management
XI	Empowered stakeholders
XII	Integrated development planning

1.3. Rockefeller-Arup

The Rockefeller-Arup document introduces the challenge, including a measuring framework, as follows: ‘The City Resilience Index (CRI) is an initiative ... to develop a comprehensive set of indicators, variables and metrics that allow cities to understand baseline, and subsequently measure, local resilience over time’ (p.1). It goes on: ‘The CRI is intended as a diagnostic tool that enables cities to assess their resilience at a city scale, in order to identify strengths, weakness and priorities for action’ (p.3). On the face of it, this is an ideal approach for city managers to deploy. There are ‘4 dimensions’ to CRI: (a) health and well-being, (b) economy and society, (c) infrastructure and eco-systems and (d) leadership and strategy. These dimensions and their ‘12 goals’ are in Table 1. Their supporting indicators are in Annex 1.

There are two conclusions to be drawn from Table 1. First, is to test the clustering, which implies some sort of ordering. Based on the re-ordered 10-points above, one would start with ‘infrastructure and eco-systems’, followed by ‘leadership and strategy’; the latter coming down to its stated ‘integrated development planning’. However, the first two clusters are also important in the wider city management context. Secondly therefore, is the need to consider these goals from a system's perspective. By doing so, even at this stage, a sense of rigour is being introduced to thinking about urban resilience.

The essence of systems theory is to understand both the ‘state’ and the ‘nature’ of the system. The state is the various technical areas. The nature is the connections or links between them. The problem is the analytical challenge of identifying each problem's structure according to its dependent and independent variables. The former can be addressed directly. The latter cannot. Offering a vary basic system's diagram helps to give a system structure to Table 1; Fig. 2.

In this depiction, the four dimensions and their goals straddle the boundary of the system: the solid circle. The intention is to suggest that some aspects of the goals will be directly achievable within the system (dependent variables). Others will lie outside the system, will have a bearing on analysis but cannot be influenced directly (independent variables). It is for future analysis for any city or town to draw out these distinctions.

2. Urban resilience – a city manager’s response

Section 2 interprets the three concepts of urban resilience in relation to current national urban development programmes in Kenya. The interpretation is through the filter of urban management.

First it is necessary to define a city manager. It can oscillate between a city's mayor and a city council's chief executive. In Kenya, the concept of a city manager is the executive head of the city government. This is different from the mayor, as the political head. Thus, the city manager is the technocrat, seeking to deliver the political will of the mayor and his/her colleagues. In this paper, the city manager, as the chief executive, is the key to pulling all the sectors together (water, environment etc). This is where the concept and practice of integrated development strategies comes in. The integration is of all the sectors, contributing to the city-building process, both within and (ideally) from outside the city government. That is the role of the chief executive as the integrating city manager. Technical directors such as municipal engineers and public health officials, make their specific contributions. The city manager seeks to achieve the holistic (urban management) perspective.

Thus, a city manager is presented here as the chief executive of the city or town. Therefore, the role requires the postholder to carry a strategic perspective to the urban challenge. However, the postholder is also bombarded with the endless frustrations of simply coping with the city's life; from harnessing rapid growth to dealing with basic services, even in unplanned or informal locations. For example, the World Bank estimates that ‘roughly 60 percent of Kenya's urban households live in housing that would be defined as a slum under the former MDGs’.¹⁰

¹⁰ Kenya's urbanisation review, executive summary, World Bank, Nairobi, 2016, p.8. This is cited in the Kenya Urban Programme document, para. 1.5.



Fig. 1. The absence of urban resilience in Kenya. Did this building receive a planning approval (land-use and design) and building consent (its structure)?

Source: BBC home page, Africa, week of December 2, 2019.

The city manager must embrace the challenge of developing his or her resilient town or city. The extent of the vulnerability facing the city must be established. If infrastructure and buildings (superstructure) collapse, everything collapses, literally (Fig. 1 again). Establishing the city's inventory can be done by physical survey and plotting on maps. If the level of sophistication is greater, the results of the survey can be transcribed digitally, within GIS. In terms of Table 1 and the conclusions to Box 1's re-ordering, this deals with infrastructure and eco-systems. One has to accept that from Table 1, 'health and well-being', and 'economy and society', are

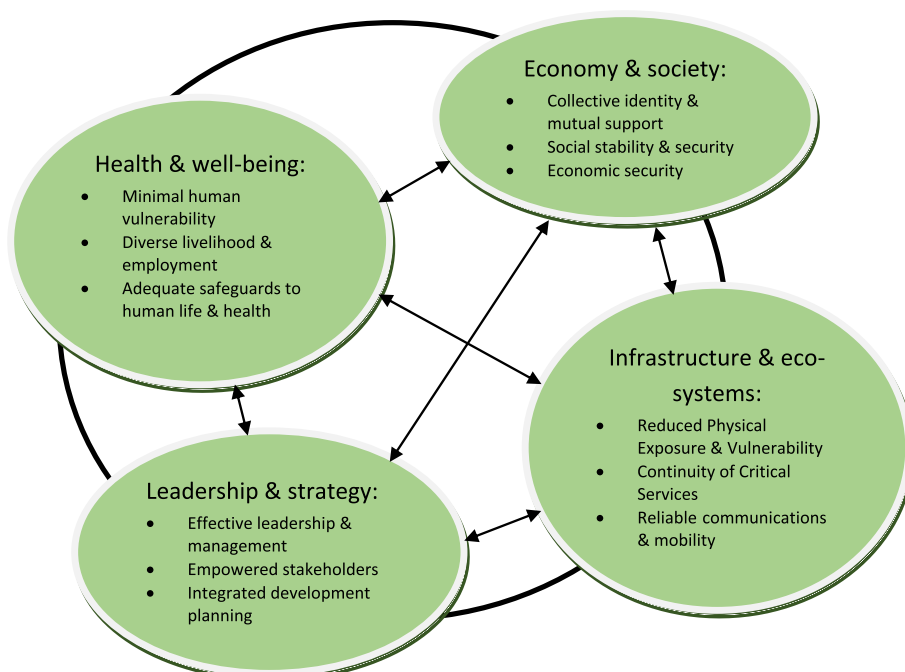


Fig. 2. The four dimensions of the city resilient goals (from Table 1).

dependent on the outcome of infrastructure and eco-systems' analysis; the initial problem definition.

Defining the problem is only a preliminary step. Strategically, geographical analysis should also take on a longer-term perspective; to plan spatially, in order to avoid future vulnerabilities. To do this suggests spatial analysis.

2.1. Spatial analysis

Spatial analysis concerns environmental issues and infrastructure networks. Specifically, the need is to understand how both help to determine the best locations for future development. From an analytical perspective, we introduce sieve analysis to build the spatial picture to generate optimal locations for future development.

Environmental conditions should be plotted on a map to show the areas to be 'taken care of; that are vulnerable' and those areas that are 'more suitable for development'. We want to define the environmental areas to be nurtured and protected; to build-up the picture of locations that are 'sound' as opposed to others which are 'unsound' for development. The theory is that by defining what should be husbanded, we define where change might occur, with the least damage and the maximum benefit; ultimately, in terms of economic development and poverty reduction.

The following is an idealised four-stage environmental analysis from McHarg.¹¹ It is presented here simply for guidance. As expertise increases, this four-stage thinking may be introduced. This leads to spatial conclusions about future development:

1. Exclusion of flood plains, woodlands for erosion control, steep slopes (gradient analysis), row cropland, cropland.
2. Exclusion of aquifer outcrops, noise zones, existing forest cover.
3. Exclusion of scenic and historic corridors. Ranking of urban suitability for sanitation arrangements.
4. Identifying of aggregations of urban suitable land (for future development).

The conclusion at this point is to identify locations that are susceptible to environmental degradation; where direct action is needed. It also suggests where best to locate future development with the least damage (and indeed, future enhancement) to the environment.

The second sieve is for infrastructure analysis. Two things are needed.

1. Identifying suitable land served by existing, water, sanitation, roads, electricity (where capacity still exists).
2. Identifying suitable land where it is most economical to provide new infrastructure and supporting services.

Network or trunk infrastructure is the collective system that binds a city together. It forms the arteries (that bind the land uses) to make the city work. Such infrastructure usually includes the following:

1. Water supply.
2. Sewerage systems.
3. Solid waste management.
4. Flood control and general drainage.
5. Power supply.
6. Trunk roads.
7. Other major (non-site specific development) roads.

All network infrastructure should be recorded as accurately as possible, on a topographical map. The water supply system should be plotted. Its capacity (or threshold), condition and level of use should be known. Where a sewerage system exists, it should be plotted, with the same supporting information. Solid waste management patterns and routes should be recorded. Flood control and strategic drainage patterns should be drawn. All utilities have to be known. Their capacity must also be indicated. Trunk roads, including their rate of use (say, movements per hour in relation to an optimum figure) should be offered. Any accompanying drainage and street lighting should be recorded. The same information will apply to all other (non-site development specific) roads. The conclusion to this analysis is two-fold. First, it helps to identify optimum locations for new (or re-development), in conjunction with the environmental conclusions. Secondly, it pinpoints where infrastructure needs to be renewed or replaced; both to cope with future shocks to the system.

Once the city's assets (its strengths) and liabilities (its environmental and infrastructure vulnerabilities) are established, a start can be made to build resilience into its system. This brings the argument to [Box 1's](#) re-ordered institutional concerns and [Table 1's](#) 'leadership and strategy'. That re-ordering is of 'physical and environmental' matters (just outlined) and 'institutional concerns'. Both

¹¹ McHarg, I (1967; republished in 1992). *Design with Nature*, Wiley, p.158. He was a student of Lewis Mumford – *The City in History* – who in turn, was a student of Patrick Geddes – the founder of the scientific town planning movement ('survey before plan') – author of *Cities in Evolution*. Geddes was originally a biologist. He used that understanding to pioneer the use of 'the survey' as a foundation for his 'conservative surgery'; getting rid of the negative influences in urban growth and supporting the positive ones. A superb example was his work in the Old Town of Edinburgh. Internationally, this included his work in Palestine and India, where he argued against the wholesale destruction of informal settlements; instead 'thinning out' and getting in natural light and clean water!.

are brought together by ‘integrated development planning’.

2.2. Integrated development planning

The supporting indicators to Table 1 are taken from a dense 252-page guide: Measuring City Resilience (2016).¹² Bringing the whole thing to a practical level suggests considering in more detail, Goal 12; integrated development planning. Even its presentation covers 16 pages. These describe four indicators to the goal:

1. Comprehensive city monitoring and data management. It then presents the specific goal as ‘regular monitoring and analysis of relevant data undertaken to inform city planning and strategies’ (p.217).
2. Consultative planning process. Its specific goal is ‘transparent and inclusive processes to develop planning policies and strategies’ (p.221).
3. Appropriate land use and zoning. Its goal is ‘integrated and flexible land use and zoning plans that ensure appropriate development of the city’ (p.225).
4. Robust planning approval process. Its specific goal is ‘transparent, robust planning approval mechanisms, consistent with planning policy and strategy’ (p.230).

What is revealing from the collective Goal 12 is that integrated development planning is centred on the spatial concept of the city. What it does not do is marry or integrate spatial planning – ultimately with the need to invest in spatial forming or reinforcing trunk infrastructure – with its supporting financing and budgeting.

An alternative integrating perspective and one which perhaps, lends itself to the practitioner level, is captured in the Kenya Urban Programme (KenUP). Its problem definition generated a four-part strategy, as follows:

Part 1: planning

Disciplined, ‘survey-based and GIS-supported’ town plans, with five-year urban integrated development strategies (in accordance with legislation), and three-year rolling fiscal frameworks, to achieve rigorous and community-supported annual budgets all with supporting civic education. This requires an acceptance of the vertical integration of land-use (or town) plans, with budgeted integrated strategies and annual budgets.

Part 2: implementation

Serious, fully capacitated and publicly honoured development control system (benefitting from civic education). A secure and robust funding system of donor and soft lending, (a) as a catalyst to privately financed infrastructure provision, to ensure sustained and locally determined capital investment and supporting services and (b) as an incentive to urban management. This requires an understanding that there are two dimensions to city-building: that which (should) go through the planning and building decision mechanisms (predominantly private investment) and that funded by public investment (predominantly trunk or strategic infrastructure). It is a fact that most city-building is financed privately. This ranges from individual household upgrading to shopping malls and speculative office blocks.

Part 3: performance

A staged development of organisational capacity building, through the incentive of access to performance-based capital funding (Part 2), to achieve economical, efficient and effective performance. This means output-based as opposed to input-based budgets. The former concerns a plan-based set of intentions to be achieved. The latter is an annual update of what was budgeted before, taking account of inflation, so input-based tinkering.

Part 4: research

Action-research leading to an intellectually driven, government supported and business embraced urban discourse, ultimately for replication internationally, with global, peer reviewed, recognition: in short, a new urban epistemology,¹³ seeking to understand the dynamics of a country’s urbanisation, to yield innovative solutions to its management. There is no reason why practicing city managers should not be engaged in ‘reflective practice’!¹⁴

The ultimate mechanism to achieve vertical alignment is the integrated development strategy. It is a rolling annual budget, within a three-year funding (or medium-term) perspective, conditioned by a five-year (integrated) development strategy. That strategy is the bridge between institutionally-based policy and budgetary planning and spatially-centred town plans. That strategy is not rolled forward annually. Instead, it is replaced by a new five-year strategy in the light of cumulative reflection in the four previous years. That development strategy is anchored to the spatial development plan, with its own 10–20 year horizon, with formal quinquennial

¹² (see footnote 7, 2nd entry).

¹³ The branch of philosophy that studies the nature of knowledge, in particular its foundations, scope, and validity.

¹⁴ The latest initiative to build a reflective city manager forum is the City2City Network; a new platform aimed at helping cities manage challenges strategically – and learn from each other. <https://www.undp.org/content/undp/en/home/news-centre/news/2019/shaping-our-future-inclusive-smart-cities.html> - accessed 30th September 2019.

reviews.

What remains is the mechanism to plan and budget for urban resilience. We advocate a vertically integrated planning system. That means the 10–20 year spatial plan, its supporting five-year integrated development strategy, its rolling MTEF, and annual budget. This is inter-locked within a performance framework; its annual report, plan and budget (ARPB). This is described in *Making Towns Work*.¹⁵ Yet even that takes a sustained effort to become a full planning cycle. A more immediate impact is achievable through the use of the urban score card (USC).

USC is a basic starting point for bridging spatial planning (the urban challenge) with performance-based budgeting (part of the institutional response). This was deployed in Kenya through its World Bank funded Development Programme (KMP); the precursor to its \$300 m Kenyan Urban Support Programme (KUSP) and government's contextual and ambitious \$1 billion Kenyan Urban Programme (KenUP). USC was introduced to all the new (47) counties; ultimately to be transmitted to their fledgling municipal boards, through their municipal (urban) managers. Its essence is a first stage analysis of urban needs. Its summary concerns:

1. Having access to clean water.
2. Having a functional sewage and garbage disposal system.
3. Having constant electricity supplies.
4. Having a home that is weather-proof and secure in tenure.
5. Being able to travel in all weather.
6. Feeling safe day and night.

For each item, there is a test to measure performance. The test is in three parts. The first is 'what is the development ambition?' SDGs are the new obvious baseline. For example, all urban users of water require 100 percent uninterrupted supply. The second is what can be achieved towards the ambition over the next five years. The movement from 'where we are now' X, to 'where we think we can afford to be in five years' Y, is the objective; i.e. increasing the water supply from X to Y. This smart objective is then the definition of the programme. The programme is structured according to its capital investment needs and supporting recurrent costs. The programme (or performance) budget is then the bottom-line level of integration; i.e. capital and recurrent budgeting together in each programme.

When one reflects again on the reality of collapsing buildings (Fig. 1), a related set of interventions are needed. Under the Kenyan Urban Programme (KenUP), the acknowledgement under 'Implementation' is that, 'It is a fact that the majority of city-building is financed privately. This ranges from individual household upgrading to shopping malls and speculative office blocks.' As the introduction states, 'only about 30 percent of construction (goes) through the official consent processes. This poses a massive capacity building let alone an institutional development challenge. As KenUP, paragraph 8.11 states:

Development control (DC) is the land-use and design key to sound investment in superstructure; the buildings that appear in every city and town ... Private investment (is) channelled (in land-use conformity, design and building standards terms) through DC. At present, it has been suggested that no more than about 30 percent of all buildings requiring official approval, go through the DC system. This is partly because of the lack of institutional maturity – nobody cares because the counties' ability to administer and enforce the DC process is weak ... However, given the scale of urbanisation in Kenya, a major dimension to the implementation challenge will be development control; its need for capacity along with a massive public awareness campaign.

A start to building urban resilience is that all buildings and supporting infrastructure are structurally sound, in both design and construction! More widely, institutional development concerns the policy and legal context, the organisational structures and the planning processes. In Kenya, the 'context' is well-stated but it is acknowledged that the building standards are outdated. The 'structure' of DC is organisationally situated but acknowledged as being weak in terms of staffing. The 'process' of DC is obviously very weak (only about 30 percent of buildings are approved).

It is argued that the integration of re-ordered Box 1's 'physical and environmental' matters with its 'institutional concerns' translates to the pragmatic approach to spatial planning (urban challenge) and performance-based budgeting (part of the institutional response), as presented here. What remains is to bring matters back to action to achieve urban resilience.

Conclusion

For the hard-pressed city manager, what does all this mean; what should be the approach? The approach suggested is three-fold; a three-stage cycle of interventions. It builds from the environmental and physical infrastructure challenges. It moves to the instrument of urban management; its 'binding address' of integrated development strategies and supporting capital and revenue budgets. Finally, it consolidates spatial planning into a vertically integrated approach to managing urban resilience; thus, both bottom-up (immediate problem-solving) to top-down (spatial planning for the future).

In year one, the environmental and physical vulnerabilities are surveyed and plotted on maps. USC is a practical starting point. The ideal is through modern GIS. This presents the inventory of assets (what is already resilient) and liabilities (what is not resilient and in need of urgent intervention). The conclusions to the analysis are the foundation for the first integrated development strategy.

¹⁵ McGill, R. (2018). Making towns work: Habitat III – what relevance? *Planning Theory and Practice*, Vol. 19, No. 1, pp. 140–148. Published online on 13 October 2017. <https://doi.org/10.1080/14649357.2017.1369237>.

In year two, the softer side of the urban system gains more analytical credibility; in [Table 1](#), the ‘health and well-being’ and ‘economy and society’ dimensions. These come in the second year because both are dependent on the environmental and infrastructure conditions, concluded from year one. That is, whereas year 1 offers the rudiments of spatial planning (the challenge), year 2 moves to institutional planning and budgeting (the response).

Year three sees the consolidation of analysis and action through the vertically integrated and iterative spatial and policy-based budgeting processes. By this third year, confidence will have grown to the point that the system’s perspective ([Fig. 1](#)) is understood as the necessary holistic approach to urban development and its need for resilience (as presented in Part 1).

In short, the challenge of building urban resilience is both an urban and an institutional, integrated systems challenge. The response is one that must guarantee both capacity and commitment; ultimately, the notion of institutional maturity. What adds extreme urgency is the context of Africa’s rapid urbanisation.

In conclusion: the cited programmes in Kenya are only at the start of an increased awareness of the urban challenge. The suggested three-stage approach to urban resilience moves these programmes to the next level of practice. To Kenya’s credit, it is now embarking on a programme to develop urban resilience strategies in five selected cities. Whether applied to Kenya or elsewhere in Africa, if every city and town manager was able to approach its urban challenge in this way, its institutional response might have a chance of gaining traction to tackle the universal imperative of achieving urban resilience. Ultimately, this approach embraces the systems perspective to urban thinking and resulting action, through the lens of urban management and its instrument; integrated development strategies.

Declaration of competing interest

There is no known conflict of interest to my title urban resilience – an urban management perspective.

Annex 1. Goals and indicators for CRI¹⁶

The Measurement Guide is a technically robust 252-page document. This annex simply introduces its structure, further to [Table 1](#) in the main text. However, detailed reference in the main text is made to Goal 12, integrated development planning.

Goal 1: Minimal human vulnerability

- 1.1 Access to safe housing
- 1.2 Water supply and sanitation
- 1.3 Energy supply
- 1.4 Food supply

Goal 2: Diverse livelihood and employment

- 2.1 Labour policy
- 2.2 Skills and training
- 2.3 Continuity following a shock
- 2.4 Local business development and innovation
- 2.5 Access to finance

Goal 3: Adequate safeguards to human life and health

- 3.1 Emergency medical resources
- 3.2 Access to healthcare
- 3.3 Public health

Goal 4: Collective identity and mutual support

- 4.1 Connected communities
- 4.2 Local identity and culture
- 4.3 Community participation

Goal 5: Social stability and security

- 5.1 Crime deterrents
- 5.2 Anti-corruption measures

¹⁶ Measuring City Resilience (2016), p.69. See footnote 5.

- 5.3 Policing
- 5.4 Law enforcement

Goal 6: Vibrant economic activity or Availability of financial resources and contingency funds

- 6.1 Business continuity planning
- 6.2 City budgets
- 6.3 Inward investment
- 6.4 Economic structure
- 6.5 Regional and global economic integration

Goal 7: Reduced physical exposure and vulnerability

- 7.1 Safeguards for protective ecosystems
- 7.2 Safeguards for critical infrastructure

Goal 8: Continuity of critical services

- 8.1 Continuity planning
- 8.2 Resource efficiency
- 8.3 Infrastructure delivery
- 8.4 Maintenance practice
- 8.5 Ecosystem health

Goal 9: Reliable communications and mobility

- 9.1 City transport networks
- 9.2 Public transport networks
- 9.3 Regional transport networks
- 9.4 Communications technology
- 9.5 Emergency information and communication

Goal 10: Effective leadership and management

- 10.1 Multi-stakeholder alignment
- 10.2 Government alignment
- 10.3 Government decision-making and leadership
- 10.4 Emergency planning and coordination
- 10.5 Risk monitoring

Goal 11: Empowered stakeholders

- 11.1 Education
- 11.2 Community awareness and preparedness
- 11.3 Communication between government and public
- 11.4 Knowledge transfer and best practice sharing

Goal 12: Integrated development planning

- 12.1 City monitoring and data management
- 12.2 Strategies and plans
- 12.3 Land use and development
- 12.4 Infrastructure and building codes and standards