BE(A)WARE: RESILIENCE IS ABOUT SO MUCH MORE THAN POVERTY ALLEVIATION

Ms. Edna Peres, University of Pretoria, South Africa, edna.m.peres@gmail.com
Prof. Chrisna du Plessis, University of Pretoria, South Africa, chrisna.duplessis@up.ac.za

Abstract

Within rapidly urbanising South Africa, 'resilience' risks turning into another development 'trend' and losing credibility. Its application and usefulness could be misunderstood and it stands at an equal risk of manipulation as sustainability has been. Narrow resilience definitions that are limited to bounce back responses frequently substitute the full and rich scope of resilience theory, resulting in doubtful suggestions that resilience is a life strategy for poverty alleviation in communities or in the reconfiguration of government investment in the spatial economy. Well-established resilience theory and the inherent potential that lies in its holistic translation into complex city systems, appears to be undervalued.

This paper builds awareness of the developmental potential that resilience thinking can unlock within the built environment; a means of proactively studying urban areas to engage policy and intervene in its design to foster conditions for life to thrive. Here, resilience indicates the strength of a system and is an emergent property thereof, not a normative principle. If used as a normative principle, then negative conditions like poverty (which can be highly resilient), are strengthened rather than collapsed, in other words, 'resilience as the goal' could perpetuate poverty. Once the drivers of resilience in a focal area are recognised then engaging with design, implementation and management becomes enriched. This paper further argues that an urban resilience perspective provides an integrative and contextual approach for enhancing the positive properties of different city systems to build their overall general resilience; a framework to develop capacity for general resilience in the city is explored through narrative examples. Potentially, resilience could inform the process to create sustainable human(e) settlements, if founded on a holistic understanding of its theory as applied to processes in the city system.

Word count: 284
Key words: sustainable, urban resilience, living city systems, South Africa

INTRODUCTION

Be(a)ware, the title of this paper stands as both a caution and a motivation. As a caution, *beware* urges built environment professionals to look beyond simplistic definitions of resilience. As a motivation, *be aware* encourages professionals to use resilience as a lens through which to understand the ability of their cities to prepare for and adapt to unpredictable changes confronting contemporary global society as a result of climate change or the possible collapse of economic, cultural and political structures. This paper explores resilience theory fundamentals, built environment professional's engagement of it, and its potential to inform a powerful approach to development. It comments on examples applying the use of resilience in urbanism by referring back to core concepts. It also shows how resilience theory holds potential to transition urban environments from managed spaces to thriving social-ecological systems where humans and nature are equal partners. This highlights the additional responsibility required by 'resilience professionals' to identify which aspects of life as we know it may need to collapse in order to provide room for new life to take root in a site's latent potentials (du Plessis, 2013, p.38) in a way that limits negative consequences, and builds positive conditions for life. This paper provides a pathway toward a proactive resilience approach to the built environment that contributes toward a reboot of the system.

A whole-systems approach to resilience
"The city is not a system of parts, but a whole system of the human species that has characteristics as a whole that transcend but include communities, organizations, groups, families and individuals and the built environment that we have created to contain us."
(Hamilton, 2008, p.31)

In an age where most people live in the cities of the world, and given their dependence on finite natural resources, urban areas cannot continue to develop on this current trajectory without significantly affecting humanity. Were it that the demands that cities place on resources and living systems were limited to the physical footprint of each city, then the collapse of a large city system would not necessarily be of concern. However, the dissipative open systems that characterise cities have made vast global networks necessary to sustain them, drawing life out of the environment to generate products and waste in return (Hamilton, 2008, p.31). A collapse of one of the larger cities could cascade throughout the global network, fundamentally testing human resilience and possibly, human survival.

Humans are profoundly affected by cities, whether they live in them or not. Unfortunately, these effects are not always tangible or quantifiable, making an assessment of their impact very difficult without the aid of a systems approach. Despite evidence that cities result from complex relationships within dynamic interconnected hierarchies of systems and sub-systems, which Holling et al terms the panarchy (Holling et al., 2002), in practice the tendency is to make cities comprehensible by isolating their parts. As an example, civil engineers, developers, architects, traffic planners, town planners, and environmentalists specialise and operate in niche areas of concern and rarely have opportunities to engage in

transdisciplinary collaboration that interrogates development from a holistic (not predominantly economic) perspective. This division through specialisation often results in weak design solutions that are the consequence of professional compromise. Effectively, simplifying the city into its parts or sub-systems, and seeking individual efficiency for its components, results in a decrease of the whole system's general resilience (Salat, 2011, p.476), making it more fragile in light of unpredictable change.

An example of oversimplifying a rich and complex subject into one that becomes easily understandable is the discussion of resilience as, "a life strategy for poverty alleviation in communities or the reconfiguration of government investment in the spatial economy" (UIA, 2013). This interpretation strips resilience of its full meaning and limits its potential for informing truly sustainable solutions to urban problems. It may inadvertently misdirect the development and evolution of urban resilience practice by promoting resilience as a 'goal' or 'solution' to development problems in ways that lack depth or definition. In order to avoid that scenario, this paper suggests that the first step in a full embrace of all that resilience thinking can offer built environment professionals, is to appreciate that cities (and the development therein) require a whole-systems approach as a foundation for viewing, studying, living and engaging with their social-ecological networks.

BEWARE, RESILIENCE MIGHT GET YOU NOWHERE

Resilience theory traces back to the 1960s and 1970s when the rise in environmental consciousness led to the reassessment of the role of human beings within the ecosystems of which they form a part. In 1973, C.S. Holling published a seminal paper introducing resilience as a characteristic of a healthy ecological system. At that time, he defined resilience as the ability and speed of a system to return to an equilibrium or steady state after a disturbance (Davoudi, 2012). Over the past forty years, the understanding of resilience as a characteristic of a system has evolved and broadened considerably into more dynamic definitions that transcend the equilibrist approaches of its origins (Davoudi, 2012). However, as it gains popularity in development circles, its full range of meaning becomes diluted and its lack of conceptual clarity cannot be used to derive or inform design.

Theoretical misinterpretations
Resilience in South Africa's built environment and development sciences has focussed primarily on the anti-adaptive 'bounce back' attempts to manage or maintain current city conditions in the face of pulse disturbances like natural disasters or protest action. For example, the influential State of South African Cities Report (SoSACR) (Turok et al., 2011) reviews post-democratic development using a resilience perspective. In its introduction, the report mentions the value for resilience to chart a different development pathway, but for the most part it focuses mainly on the ability of cities to continue functioning within their status quo, and 'bounce back' from threats and disturbances. It inaccurately frames resilience as a positive systemic goal through statements like, "…difficulties experienced by the metros indicate vulnerability and instability rather than resilience" (Turok et al., 2011). This

misinterpretation of resilience occurs repeatedly and calls for reassessment; resilience itself is not the goal, it is a characteristic of a system's functionality and it is therefore value-neutral. In fact, long-term pressures like climate change, crime, corruption, rapid urbanisation and pervasive urban poverty (that includes a lack of quality education, basic services and safety) reflect the qualities of highly resilient yet perverse systems, which may require dismantling and entire reconfiguring. The alternative framing of the SoSACR statement would rather be 'to identify difficulties resulting from highly resilient (albeit undesirable) system-states that perpetuate the existence of negative urban values'. Therefore, the second step toward reaching a full resilience embrace is to see that resilience itself is neither good nor bad, nor is it the solution or the goal; as a characteristic emerging from a system, it holds potential to be the metaphorical lens through which to find the strengths and weaknesses of a city system (Walker & Salt, 2012, p.20).

Is resilience just another 'trend'?
With more reference made to resilience in research and practice, one of the main criticisms against its application to the urban realm, is that it is simply a rebranding of the 'green' movement or sustainability itself (TRUST, 2012). To avoid resilience becoming another word for 'development as usual', and to understand its possible application to architecture and planning, some issues associated with the progression of resilience theory, need mentioning. Firstly, the range and depth of resilience theory can be confusing, therefore in its translation to the broad spectrum of built environment professions it often becomes a 'new solution to our problems' when it is actually a characteristic of the systems that produced the problems in the first place. Secondly, when a concept like resilience encompasses too much and becomes too wide, it loses its specific meaning and the intensions behind its application become unclear (Brand & Jax, 2007, p.9).

The 2014 International Union of Architects World Congress call for papers displays similar confusion. Under the umbrella of '*architecture otherwhere*', the task of "looking elsewhere for new ways of creating a better future" presents itself, and "alternative strategies for the design and delivery of human settlements" are called for. To explore this task, three departure points are suggested and include resilience. However, defined as a "life strategy or critical intervention" the proposed exploration of resilience leans toward psychological and economic resilience approaches that can be developed by a community in order to overcome challenges like poverty. All the other definitions of resilience (many of which hold more affinity to architecture) have been ignored, as have its full range of qualities such as the capacity for the city to evolve and regenerate through diversity. The congress further infers that resilience is an end-state solution. It is put forward as an answer for a reconfiguration of the spatial economy, rather than as the conceptual framework that builds an understanding of the drivers within cities that are perpetuating a twisted spatial economy in the first place. As resilience thinking gains popularity, it risks being superficially misinterpreted. Therefore, the third step toward reaching a full resilience embrace is to refrain from engaging resilience in practice without first exploring the scope of the theory and its foundational meanings.

BE AWARE, RESILIENCE CAN REGENERATE LIFE IN CITIES

Resilience research has largely been driven by the need to achieve sustainability (Davoudi, 2012); to navigate development in a way that sustains bio-physical life as we know it. However, what we mean by sustainability is itself evolving: what was interpreted a few decades ago as a preservation of the consumer-driven status quo is now a questioning of the over-all systems themselves. A new paradigm of sustainability therefore emerges from an ecological worldview that is based on "the idea of an interdependent and interconnected living world in which humans are an integral part of nature and part of the processes of co-creation and co-evolution that shape the world" (du Plessis, 2011).

The main definitions of resilience
Four clear definitions of resilience (encompassing both general and specific responses) that have been summarised by Davoudi (2012):
- *engineering resilience*, the ability of a system to return to a 'pre-disturbance state' and the speed it takes to do so, including its efficiency, predictability and constancy (this is used to try to manage, mitigate and rebuild after a disaster);
- *ecological resilience*, the magnitude of disturbance that a system can absorb without severely compromising its survival within a narrow range of permissible fluctuation (this is used to try to improve the capacity of the system to survive a perturbation without collapse);
- *bounce back or disaster management resilience*, where the focus is on the capacity to rebound to the status quo after destruction, and manifests in various fields like urban theory, psychology, economy, environmental planning, governance and climate change adaptation;
- and *evolutionary or social-ecological resilience*, which acknowledges that complex social-ecological systems change, adapt and very importantly, transform after a disturbance in ways that transcend but include all the previous states, thereby changing the overall state, but not the core identity of a system.

While there are other categorisations of resilience that delve into the use of resilience as a boundary object or descriptive concept (Brand & Jax, 2007), there is greater potential for *urban* resilience to form an overarching concept capable of identifying opportunities for integrative architecture and life-enhancing development. Refinements in resilience definitions also hold potential to inform how we can 'build' the ecological worldview, by highlighting what to focus on (the lenses) and providing a path (map). Therefore, the fourth step toward embracing the fullness of the resilience concept is to understand that there are various definitions of resilience, which together represent "the life sustaining aspect of nature that yields to external forces and in that yielding keeps the system from failing or being destroyed" (du Plessis, 2013, p.35). A combination of these definitions, are required in the holistic study of an ecologically sustainable urban system that is inclusive of tangible and importantly, its intangible qualities.

A perspective for studying urban systems: the lenses

Urban resilience practice embodies an on-going study of city systems in order to create, maintain or unlock the conditions required to adapt and evolve to changing circumstances without causing cities to lose their functional identity as large-scale human habitats. It provides clues to arrive at a reassessment of the status quo of a system, whose core-function is to create conditions where life can find nourishment even if it means that some of its systems may need to collapse to achieve this. In terms of this congress, its potential lies in being able to innovatively leap-frog the 'poverty alleviation' debate and outgrow the 'sustainability' checklists which are trapped in maladaptive system-states, and to do so by leveraging the city's regenerative qualities to envision and create *different* conditions and systems that hold the capacity within which life can flourish and evolve (Hamilton, 2008). Urban resilience is therefore the capacity of a city system (comprising both social and ecological aspects) to maintain its core purpose and integrity in the face of radically changed circumstances (Zolli & Healy, 2012), or if so required, to transform in response to these circumstances in order to maintain its integrity (Gotham and Campanella, 2010). The fifth step in a resilience understanding shows resilience practice driven toward both maintaining healthy systems as well as transforming weak ones.

A pathway for resilient design: the map

Up to this point, this paper explored the engagement and level of understanding of resilience theory in the South African built environment and realigned a few key aspects regarding its interpretation. It also identified the first five concepts beneficial to building a resilience understanding. This section, describes the next four themes beneficial to applying resilience thinking to the urban built environment, by way of a few narrative examples.

Resilience is contextually rooted and generated. The unique context that describes a city system affects the interconnected and interrelated systemic relationships influenced by pulse (fast) and press (slow) disturbances across many scales that burden the functioning of the system. Every place has a story of how it emerged and functions, and this story provides clues about the potential and direction that future development can follow. An example of a project that has been generated from a keen appreciation of the physical integrity, biography and essence of the site (Dey, 2000, p.134), is the mile-long High Line park project in New York. Built in the 1930s to alleviate some of the dangers that freight transport was presenting to daily activities in the streets, the raised railway line connected production houses to each other and formed a conduit of trade and production through the city for almost 50 years (Anon., n.d.). As the shift from rail to road transit increased in the 1950s, the demands on the High Line decreased resulting in the demolition of a portion of the structure in the 1960s. By the mid-1980s, property owners began lobbying for the demolition of the remaining structure which given the thinking of the times, was seen as a redundant feature detracting from property prices. In the early 2000s concerted efforts were made by residents in the neighbourhood to reclaim the highline through preservation and reuse. Through a long process of investigation and lateral thinking about the generative properties of the structure, a solution emerged where the High Line could become a conduit once more. This time, it focussed on flows of Life and not merely on goods (*Figure 1*).
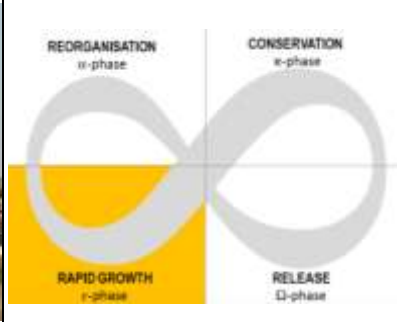
Figure 1: *The High Line railway system in New York City, now used as a conduit of Life through the city (du Plessis, 2012)*

Apart from preserving the physical integrity of the structural heritage and studying its biography overtime, its intangible meanings and qualities expressed through its essence, provided clues for its future appropriate re-use. Christopher Dey describes the importance of aligning past and future properties of place: "All places are formed in the past. All ideas for building projects are in the future. Unless we can marry past and future, everything we do will always be, at least in part, 'out-of-place'" (Dey in Fox, 2000, p.134). Aligning development to the historical evolution of the site and its natural trajectories, its 'story of place', contributes fundamentally to the long-term success of any intervention (Mang & Reed, 2012). This is the sixth step in an urban resilience approach.

While studying the story of place over a long time, patterns begin to emerge, signifying that history repeats itself. All living systems undergo cycles of change (moving at different speeds) where the phases of each cycle have their own manifestation. Some cycles take a long time, (e.g. centuries) to complete a sequence, while others change rapidly over the course of a few hours. This cyclical pattern moves through four distinct phases of adaptation and evolution that continuously flow into each other. This pattern is called the adaptive cycle in ecological resilience studies (Walker & Salt, 2006, p.75), and the concept translates well into the built ecology. As man-made extensions of the natural environment, cities also

undergo these four phases of adaptation across multiple scales in the city (du Plessis, 2012). The four phases of the adaptive cycle are usually illustrated through a *figure of 8*, with the fore loop signifying the first two development phases and the remaining two phases of the back loop signifying a release of energy. Using a hypothetical South African city as an example, the adaptive cycle can be illustrated; firstly, a steady period of Rapid Growth with high levels of investment into the system through various types of development opportunities that begin to flourish (*Figure 2*). A Conservation phase follows, where the city's dominant system-state streamlines and the existing built environment is managed and maintained often to the point of lock-in (*Figure 2*). These relationships might continue to a point after which the locked-in system-state will cross a tipping point and enter a chaotic period of Release, which is the next phase (*Figure 2*). Lastly, a Reorganisation phase begins where completely new opportunities for development occur and are harnessed in a reboot of the whole cycle (*Figure 2*). Being able to read these changes in the study area's adaptive cycle (be it a building, neighbourhood or city) and understanding what possibilities and restrictions are set in each phase is the seventh step in a resilience approach.

PHASE DESCRIPTION	PHOTOGRAPHIC EXAMPLE	ADAPTIVE CYCLE PHASE
Rapid Growth Phase: For example, the migration of people from rural areas to a typical South African urban area then increases the demand for affordable housing close to jobs. Where housing is not available, informal settlements emerge as a self-organised response to the need for housing, close to opportunities, at affordable rates.		
Conservation Phase: For example, the informal settlement described above might place enough pressure on city council to establish a settlement and to provide basic services and formal RDP housing. This could in turn attract more people to the area: informal infill structures, illegal connections to services and higher demands on limited resources, are the result.		

Release Phase: A collapse of service delivery in the area or high levels of corruption and deteriorated building stock, might lead to the destruction of existing municipal infrastructure through violent protest action, NGO involvement might create improved amenities, or high demand for the redevelopment of large portions of land into different typologies might transform property ownership.		
Reorganisation Phase: Conditions unlocked by the previous phase may allow for a reconfiguration of the housing policy or lead to new building typologies and tenure designed by engaging the community, which might also allow for incremental self-organised development in future. There might also be projects for the provision of a crèche, clinic, urban greening or parks.		

Figure 2: An example of an Adaptive Cycle focused on housing as it unfolds in a city system starting at the rapid growth phase. (Peres, 2014 adapted from Holling, 1986)

A healthy and resilient system is one that has diversity built into its DNA (Hamilton, 2008, p.16), for it is through diversity that a system can adapt to shocks and stresses in various ways according to the nature of the crisis. A city system without diversity or built-in redundancy may be crippled by a single disaster that can potentially collapse even the most efficient network. Achieving diversity is possible through improving both functional diversity and response diversity. Since these concepts emerge from ecological resilience theory (Walker & Salt, 2006) they synergise once more with urban ecologies. Functional diversity in cities would relate to richness provided by a mix of uses that are on offer at various scales in the city, like retail, residential, and green space. Response diversity would represent the typological responses to each of those functions. For example, residential responses would see a range of building typologies ranging from the homeless appropriating public space, to structures like shacks, townhouses, apartment blocks and low-density luxury houses (du Plessis, 2012). In retail it might range between a mobile street trader moving between cars at an intersection (with fast response times; selling umbrellas on rainy days or cool drinks during hot ones) to large big-box multi-national retail stores at the other end of the scale (with very slow response times especially during times of recession) (Ferreira & du Plessis, 2013). Destroying one functional response will have much more manageable consequences than collapsing an entire function set, because other functional responses can take over the role of a missing response, but a collapsed function set cannot necessarily be substituted.

- Apartment block
- Semi-Detached housing
- Luxury free-standing houses
- RDP units
- Temporary structures

RESIDENTIAL

- Mobile vendor
- Fixed point street trader
- Spaza shop
- Convenience stores
- National chain stores
- Multi-national franchise

RETAIL

- Schools & libraries
- Clinics & hospitals
- Cultural & community centres
- Religious
- Police station
- Sports & Recreation

SOCIAL AMENITIES

Figure 3: *An example of a few functions and the potential diversity of responses for each, in a city system. (Peres, 2014)*

Architecturally, the functional and response diversity is reflected in the robustness of the building typology, its position on a stand and the design of its edge conditions, core structure, shape and technologies, which critically define the potential evolution, usefulness and reuse of the building in future and overtime. This then is the eighth step in a resilience approach, to encourage functional and response diversity throughout the city so that the building stock can increase its capacity to absorb shocks or evolve and adapt to changing conditions through a variety of responses.

The final step in this exploration of urban resilience practice is to create conditions in the city where life can actively regenerate or transform failing systems. In this instance projects become "engines of positive or evolutionary change for the systems into which they are built" (Haggard, Reed & Mang, 2006). The latent potential inherent in the story of place of a site or building is analysed in order to find ways in which different systems can start feeding each other, sharing resources (such as cross-programming and industrial ecology), or re-envisioning processes (such as re-establishing connections between local communities and nature in industrial sites). Another important feature is to generate design from positive qualities, rather than trying to 'fix problems'; achieved by aligning new functions to the potential sets of the site and allowing uses to evolve toward greater complexity and depth. Designing for regenerative conditions leaves room for the unexpected to occur, by creatively unlocking ways for the latent potential of site to connect the tangible environment with the intangible psychological and spiritual well-being that is integral to life in the city.

CONCLUSION

Resilience theory provides a rich umbrella concept to bring together a number of built environment professions and equip them with a common language with which to approach the tricky subject of development in a world facing an uncertain future. When applied to urban systems, resilience highlights the need to look beyond a study area toward the broader system in order to identify the invisible links that influence the flows in the city web. An urban resilience approach incorporates a few key ideas, which are summarised. To create change, understand the system's resilience. This provides clues as to where and when change can happen in the city's adaptive cycle, through effective interventions. Different facets of the city require different types of resilience lenses to align to appropriate interventions, so that a holistic solution can build on the evolution of the story of place. To that end, resilience is neither good nor bad and it is neither a dogma nor a goal. It is simply a way of thinking about and understanding cities in order to make informed decisions about the impact of an intervention on the future trajectories of the city.
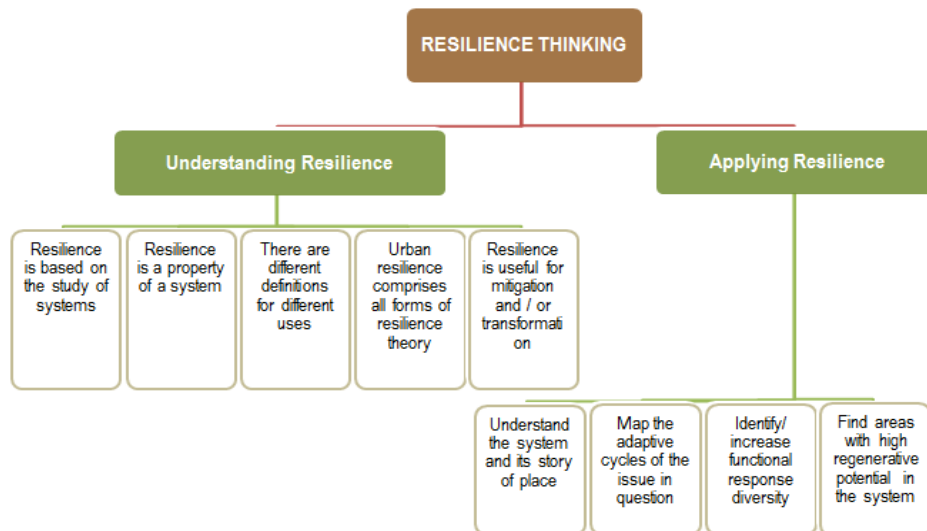
Figure 4: *Framework for building an urban resilience approach. (Peres, 2014)*

In its application to cities, resilience thinking provides valuable qualities with which to equip cities across scales to deal with unpredictable disturbances (
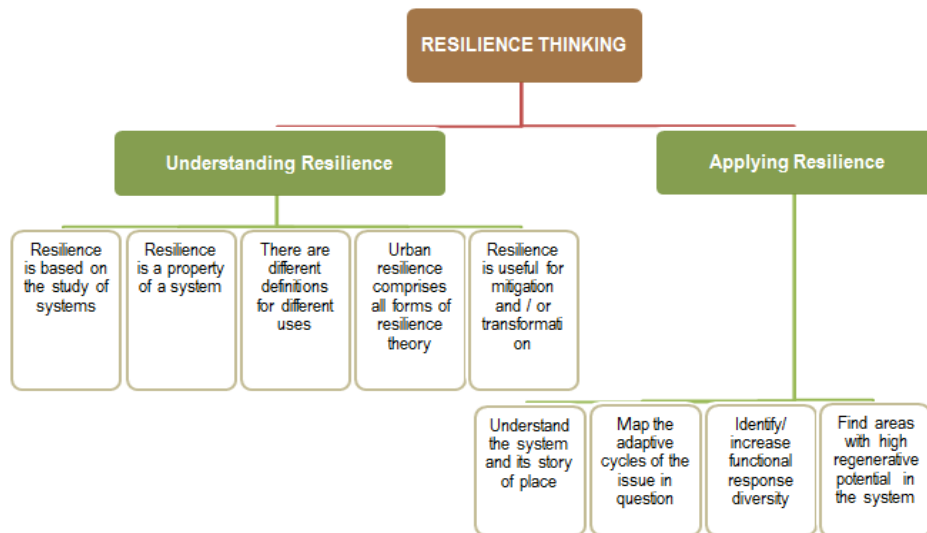
Figure 4). The general resilience of a city can be increased by growing its capacity to bounce back, absorb change, adapt or transform, and this capacity can be promoted through diversity of functional and design responses. Lastly, a regenerative system is also resilient, therefore being able to work with the positive strengths of a site to harness flows of energy that can regenerate human and non-human life on site before or after a disturbance, is an important aspect of survival. Above all, resilience is an overarching characteristic that humans will have to build within themselves and their environment, in order to transition through the drastic changes contemporary societies throughout the world must undertake. Building resilience requires of us to move from a mind-set of fixing empirical problems toward embracing multidimensional change.

LIST OF REFERENCES

Anon., n.d. *Friends of the High Line*. [Online] Available at: http://www.thehighline.org/about/high-line-history [Accessed 27 February 2014].

Brand, F. & Jax, K., 2007. Focusing the Meaning(s) of Resilience: Resilience as a Descriptive Concept and a Boundary Object. *Ecology and Society* , p.12(1):23.

Davoudi, S., 2012. Resilience: a bridging concept or a dead-end? *Planning Theory & Practice, Vol. 13, No. 2*, pp.299-333.

Dey, C., 2000. Ethical building in the everyday environment: a multilayer approach to building and place design. In W. Fox, ed. *Ethics and the Built Environment*. London: Routledge.

du Plessis, C., 2011. Shifting paradigms to study urban sustainability. In *Proceedings Vol 1: SB11-World Sustainable Building Conference, October 18-21*. Helsinki, Finland, 2011.

du Plessis, C., 2012. Applying the Theoretical Framework of Ecological Resilience to the Promotion of Sustainability in the Urban Social-Ecological System. In *SASBE*. Sao Paulo, 2012.

du Plessis, C., 2013. Resilient and regenerative - the Yin and Yang of a new development paradigm. *Earthworks*, (13), pp.35-38.

Ferreira, A. & du Plessis, C., 2013. Determinants of Urban Resilience: an exploration of functional response diversity in a formalising settlement in the City of Tshwane, South Africa. In *World Building Congress, 5-6 May*. Brisbane, 2013.

Hamilton, M., 2008. *Integral City: Evolutionary Intelligences for the Human Hive*. Gabriola Island, Canada: New Society Publishers.

Holling, C., Gunderson, L. & Peterson, G., 2002. Sustainability and Panarchies. In L. Gunderson & C. Holling, eds. *Panarchy. Understanding transformations in human and natural systems*. Washington DC: Island Press.

Mang, P. & Reed, B., 2012. Designing from place: a regenerative framework and methodology. *Building Reseach & Information*, 40(1), pp.23-88.

Peres, E. & du Plessis, C., 2013. The threat of slow changing disturbances to the resilience of African cities. In *World Building Congress, 5-6 May*. Brisbane, 2013. CIB.

Salat, S., 2011. *Cities and Forms: On sustainable Urbanism* . Paris: Hermann.

TRUST, 2012. Prepublication draft Report on the National Colloquium on Urban Resilience.

Turok, I. et al., 2011. *State of South African Cities Report 2011: Towards Resilient Cities*. Johannesburg: South African Cities Network South African Cities Network.

Unknown, 2013. UIA Congress, Durban. *Architecture South Africa*, (64), p.5.

Walker, B. & Salt, D., 2006. *Resilience Thinking: sustaining ecosystems and people in a changing world.* Washington: Island Press.

Walker, B. & Salt, D., 2012. *Resilience Practice: building capacity to absorb disturbance and maintain function*. Washington: Island Press.

Wilber, K., 1996. *A Brief History of Everything.* Boston : Shambhala.

Zolli, A. & Healy, A., 2012. *Resilience: why things bounce back*. London: Headline Publishing Group.