The 4IR UZ-DRUP Urban Observatory: Tactical Urban Resilience through Applied Game Theory

DICKSON. D. MHLANGA

Abstract

This paper explores the possibility of how urban resilience can be enhanced through the use of applied game theory. The aim is to introduce the concept of a Local Urban Observatory as a tool that will facilitate higher levels of urban resilience. The paper builds on secondary data while making a case in which reflection and application are interwoven into a discussion for mapping the future of the Department of Rural and Urban Planning at the University of Zimbabwe. It is acknowledged that we are now living in the Fourth Industrial Revolution. This revolution is characterised by the emergence of cyber-physical space, the internet of things and networks. Its fundamental characteristic is that of disrupting long standing traditional socio-economic systems which include prevailing urban model paradigms in Zimbabwe. Firstly, an overview of Game Theory is explored as it relates to urban resilience and climate shift. Secondly, the operational paradigm of the fourth industrial revolution and how it is disrupting existing urban paradigms is put forward. The model of the 4IR (4th Industrial Revolution) Urban Observatory is then described and how it can assist in promoting urban resilience. The key issue is to understand how urban resilience and climate shift can be better understood through the use of concept of Game Theory. It is concluded that for enhanced future resilience, urban systems in Zimbabwe need to shift to new paradigms of infrastructure design and deliberately develop 4IR communities. To achieve this, tools such as the Urban Observatory are now indispensable in the future.

Keywords: *Game theory, Urban Resilience, Climate shift, Urban Observatory*

INTRODUCTION

This paper introduces the concept of a Local Urban Observatory as a tool that will facilitate higher levels of urban resilience. It is acknowledged that we are now living in the Fourth Industrial Revolution. This revolution is characterised by the emergence of cyber-physical space, the internet of things and networks. Its fundamental characteristic is that of disrupting long

standing traditional socio-economic systems which include prevailing urban model paradigms in Zimbabwe. Firstly, an overview of Game Theory is explored as it relates to urban resilience and climate shift. Secondly, the operational paradigm of the fourth industrial revolution and how it is disrupting existing urban paradigms is put forward. The model of the 4IR (4th Industrial Revolution) Urban Observatory is then described and how it can assist in promoting urban resilience. The key issue is to understand how urban resilience and climate shift can be better understood through the use of concept of Game Theory. The paper builds on secondary data while making a case in which reflection and application are interwoven into a discussion for mapping the future of the Department of Rural and Urban Planning at the University of Zimbabwe.

LITERATURE REVIEW

'Life indeed is a game!' Game in this statement is not attributed TO that casual, loose context construed to the realm of pleasure and recreation. Game here is described within the perspective of Game Theory as put forward by John Von Neumann and Oskar Morgenstern (1944). Game Theory is described as the formal study of decision making where several players must make choices that potentially affect the interests of other players (Turocy, Von Stengel; 2001). In Game Theory, players are described as decision makers within the context of a situation. Each player employs a strategy, which is a plan of action set to achieve a particular outcome that has benefits. These benefits are defined as pay-offs. A pay-off may be positive, negative, tangible or intangible. The information set is described as the information available online: any given point within the game and upon which players make decisions on choice of strategy. Equilibrium is a point within a game where all players have made decisions and an outcome has been arrived at.

Within the context of pay-off, games may be described as zero-sum games or non-zero-sum games. The zero-sum game is where the summation of the rewards of all players equals zero. In this type of situation, the gains of one set of players combined with the losses of the other set of players equals zero. The assumption here is that there are positive and negative rewards. A Non-Zero-sum game is where the summation of the rewards of all players (both positive and negative) does not equal zero. Within the context of duration; games may also be described as finite and infinite. A finite game is described as a game with known players, fixed rules and agreed upon objectives; for example, football. An infinite game is described as a game

with known and unknown players, the rules are mutable and the objective is to keep the game in play ad- infinitum and life is an example of such a game. In the infinite game, it continues forever. Obsolete players exit the game whilst new ones enter as the match continues in perpetual state of flux.

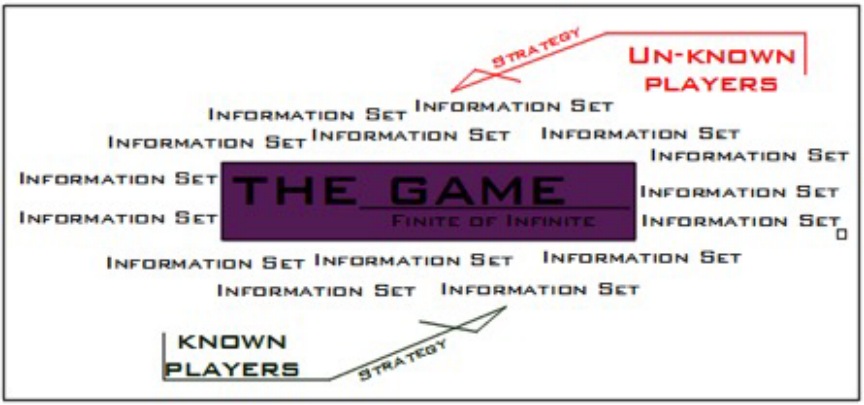

Figure 1: Principles of Game Theory

Table 1: Game Theory Parameters

1. Nature of the Game (Duration)	Finite or Infinite
2. Nature of Game (Pay-off)	Zero or Non-Zero-sum Game
3. Players	Which are the current known players, which player is heading towards redundancy, which player is evolving? Always factor in the unknown new player entering the game at any time
4. Information Set	What is the current information available to players within the game? Do all the players know this information set
5. Strategy	What is the strategy being employed by the players in the game?
6. Pay-off	What is the pay-off that each player in the game is expecting? Are they tangible, intangible, positive or negative?
7. Equilibrium	What are the possible points of equilibrium in the game?

THE STRATEGY: URBAN RESILIENCE

In the infinite game of life, humanity uses urban systems as a strategic platform to acquire pay-offs. The aspiration of humanity is to derive positive pay-offs that satisfy their needs. One of the requirements of the urban system is that it be resilient. Resilience is defined as the ability of an urban system to maintain continuity through all shocks and stresses while positively adapting and transforming towards sustainability (UN- Habitat, 2019). One of the most pragmatic ways of understanding urban resilience is to place it within the context of the life game scenario. This allows for more expansive thinking as regards how urban resilience fits into this. It demands a clearer definition of who the players are, what information sets exist at specific points in time and what the pay-offs are. Table 2 contextualises urban resilience using the game theory parameters.

Table 2: Expanding the Urban Resilience Paradigm

Question: Urban Resilience	**Game Theory Parameter Context**
Game Context	It is an infinite non-zero-sum game
Player profile	Known players; humanity and ecosystems Unknown players: Unknown at this time but contingency demands their acknowledgement as a game variable
Pay-Offs	Humanity: Positive Ecosystems: Positive
Strategy	*Humanity*: There is a drive towards sustainability and a new urban agenda although current methods use 3rd industrial revolution economics and production processes. The use of urban systems as platforms to acquire need a fulfilment. *Ecosystems*: Perpetual evolution of ecosystems through tectonic movements and climate shift. Cyclones, earthquakes, drought, flooding and extreme temperatures as facilitators of ecosystem evolution.

THE KNOWN PLAYERS

In the life game scenario, the assumption is that it is an infinite non-zero-sum game and each players strategy seeks positive pay-offs.

Humanity

Manfred Max-Neef (1991) proposed nine fundamental human needs which are subsistence, protection, affection, understanding, participation, leisure, creation, identity and freedom. He further stated that these needs operate within the four existential dimensions of being, having, doing and interacting. This elaborate definition of human needs clearly sets out expected pay-offs (nine fundamental needs) and also the four strategic activity areas to realise them (the dimensions of being, having, doing and interacting). UN-Habitat predicts that by the year 2050, 70% of the global population will be living in urban centres (UN-Habitat; 2019) and it is in these urban systems where human needs will be fulfilled. It is with this in mind that urban centres must be prepared for this role. The future will place new, exacting demands on urban infrastructure and its management. To survive into the future, new paradigms regarding infrastructure design and urban management must be developed.

Another major consideration which must be factored by present and future generations is the player life-cycle. The highest global individual life expectancy is currently at 84.2 years (WHO; 2016) whilst the probable existence of humanity can be perpetual, depending on how they play the game. It is thus important for humanity to develop a strategy that ensures individual self-actualisation whilst at the same time guaranteeing the perpetuity of the species in the infinite game. Simply stated, to survive the future urban systems must carefully rethink production and consumptions patterns and this will entail developing new green based urban system and economic models.

Natural Ecosystems

An ecosystem is a system comprising of living organisms and non- living components (Odum, Eugene; 1971). This system is symbiotic in its design although continually evolving and can exist in perpetuity. Within the infinite life game scenario, it is important to quantify the magnitude of this player. Natural ecosystems have been in existence for millions of years, continually changing structure along their evolutionary path using complex physics such as gravity, magnetism and climate shifts. In 2018 alone, weather catastrophe related economic losses were pegged at US$ 215 billion dollars (www.statista.com; 2019). This statistic alone clearly shows how humanity has failed to properly put into context natural ecosystems as a player in the

life game scenario. The scale of strategic movements that natural ecosystems make is large in scale and it is imperative that the global community understands this and begins to factor its strategy based on it. With this knowledge it is clear that the infrastructure of future urban systems cannot be static or macro in its design. To achieve a higher resilience factor, future urban infrastructure design must be based on self-sustaining cellular units that allow individual cells of infrastructure to function independently.

Nature and Dynamics of Urban Data Required Today

Spatial planning in its definition is the professional practice that creates *places* where people can exercise their free will to fulfil their needs. The definition of needs is defined according to the Max- Neef hierarchy of needs (Max-Neef, 1991). To make urban systems more resilient, specialised urban planning data sets must be developed. This data must include the physical and intangible aspects of place.

Physical Data of Place

This involves the collection of local geo-physical aspects (climate shift, meteorology, oceanography and volcanology), physical infrastructure and designated land use data. This cluster of data will be used to indicate indexes such as climate shift vulnerability, infrastructure functionality, convenience, accessibility and safety as they are contextualised in the sustainability and new urban agenda.

Intangible Data of Place

The physical data is basic platform upon which the true operations of spatial planning commence. To create contemporary urban systems, the following dynamic data sets are required:

- *Human Needs Data:* This data will illustrate and explain where and how urbanites are fulfilling their human need requirements. Mind mapping techniques are useful in this endeavour.
- *Sensory Perception Data*: This data is developed based on the five human senses of sound, sight, touch, taste and smell. It is used to determine where urbanites feel the highest pleasant and unpleasant sensations of these senses. This will be developed to indicate green, orange and red

zones. Green zones will be where urbanites feel the most comfort, orange zone being the middle ground and red zones being the most uncomfortable zones.

- *Urban Culture Data*: This is data on cultures, beliefs and values that exist within urban systems and how they are expressed spatially. Urban areas are cosmopolitan melting pots of local, regional and international cultures. This cultural diversity can be very useful in developing vibrant urban systems through the use of mediums such as music art and culinary culture.
- *New Urban Ideology Paradigms*: This data set will catalogue emerging new urban ideologies and their impact on existing and future land use and development models. Ideas such as the fourth industrial revolution, the economy for the common good, block chain, digital currencies and e-commerce would fall into this category.
- *Intelligent urbanism data*: This is based on the work of Josep Sert, Team Ten and the International Congress of Modern Architecture (Benninger, 2002) and it encompasses the following data sets:
  - *Ecosystem Data*: This data examines the built and natural environments as a balanced equation determining how much the urban system can expand to reach a point of equilibrium with the natural environment. This data also examines the nature of inputs and outputs of the built environment and their impacts on natural ecosystems. Aggregate data on recycling and re-use initiative is also collected.
  - *Appropriate Urban Technologies*: Data on geo-climatic conditions, local resources, demographics and financing structures will be collected to determine appropriate technologies that will enhance resilience
  - *Conviviality*: This data is linked to the new global concept of GDH (Gross Domestic Happiness). It details social interaction hierarchies, the infrastructure used, cultural preferences and demographic profiles of the users. It focuses on social infrastructure based on individual, friendship, household, neighbourhood and community preferences.
  - *Urban Efficiency*: This data set is used to assess how efficient urban systems are at utilising resource inputs such as energy and human capital to create goods and services. It also highlights any wastage points in the urban system.

— *Urban Human Scale Data*: This is anthropometric data that is used to assess how usable the urban system is from the human perspective of scale and the four dimensions of length, width, height (the 3 Dimensions) and time.

— *Opportunity Matrix*: This data list and compares the opportunities of regional urban systems against each other. This data will indicate opportunities for personal and social development.

— *Regional Integration*: This data will indicate socio- economic relationships between neighbouring urban systems

— *Institutional Inclusion*: This data will indicate to what levels various institutions within the urban systems are included within the spatial planning process.

Global and Regional Experiences in Observatory Development

A typical observatory is defined as a location for monitoring terrestrial or celestial events. Astronomy, climatology/meteorology, geophysical, oceanography and volcanology are examples of disciplines for which observatories have been constructed. Observatories can be ground based, airborne or space based (Wikipedia, 2019). The majority of urban observatories today simply expand from this definition and go beyond collecting geo-physical data to also monitoring human activities including infrastructure and its performance within urban centres. The inception of the third industrial revolution brought about the need to understand more about the dynamics of production and trade as it related to economic processes. This brought about the establishment of the first rudimentary economic observatories and the 1940s saw the development of monthly publications that presented economic indicators that evaluated the performance of the American economy. This was taken further in the 1960s and 1970s when scientists developed indicators to measure social change and in the 1990s broad indicators relating to sustainability emerged and thus the first urban observatory platforms were developed (Wong 2006).

Today, there are a multitude of observatories globally. These observatories usually operate within the thematic areas of infrastructure (water, sewerage reticulation, and energy), transportation, land use, sustainability, climate and economic activity. Across all these categories, their main function is to collect urban data, analyse it, package it and finally disseminating it for purposes of

assisting in decision making processes. It is important to note that they do not make decision, but provide relevant data for decision making. The skills required to operate a functional observatory will inevitably vary depending on its mandate. However, it will operate around four critical cores which are a multi- disciplinary team, statistical analysis, information management and a communications centre. There currently is a 4- level classification of Urban Observatories which are global, regional, national and local (UN-Habitat, 2019).

Global and Regional Urban Observatories: Case of UN-Habitats' Global Urban Observatory

Global observatories collect, analyse and disseminate data through the formulation of global principles, policies, standards and information. These are then taken up by national governments for implementation at local levels through its democratic structures and can be done solo or with the assistance of development partners. In essence, global urban observatories are excellent data sources which when used in conjunction with innovative local delivery systems, can yield extremely positive results. UN-Habitat maintains a Global Urban Observatory in charge of global monitoring mainly its habitat agenda and other agendas' which are within the urban sphere. It monitors building capacities of governments. It is also responsible for establishing local, regional and global mechanisms for urban indicators covering the thematic areas of economy, environment, social dynamics, health and transportation (UN-Habitat, 2019). Key agendas that are facilitated through this observatory are the current Sustainable Development Goals (SDG's) and the New Urban Agenda.

National Observatory: Case of South Africa

National observatories generally host national data-sets obtained from individual provinces or states. The critical distinction that such observatories have is that data is collected and interpreted based on current national short, medium- and long-term interests. An observatory of this classification is usually under the custodianship of national agencies. The South African National Development Plan 2030 launched in 2013 aims to eliminate poverty and reduce inequality by 2030. According to the plan, South Africa can realise these goals by drawing on the energies of its people, growing an inclusive economy, building capabilities, enhancing the capacity of the state, and promoting leadership and partnerships throughout society (South Africa

National Development Plan 2030). To achieve its 2030 vision, one of the tools proposed to be developed is an observatory that will develop the capacity for effective spatial decision making and implementation. One of the tasks of this observatory would be to monitor urban and rural space with the focus on the development and management of terrestrial space (Coetzee, Smit, 2015).

Local Urban Observatory: Case of UKCRIC (United Kingdom Collaboratorium for Research on Infrastructure and Cities

Local observatories can fully function in isolation developing and providing data for their metropolitan regions. Within the hierarchy of urban observatories, they collect the most detailed data of all. This data will then be used in local decision-making processes. These observatories can also be utilized as a network to provide data for designated regions. United Kingdom Collaboration for Research on Information and Cities (UKCRIC) is a collaboration of UK based network of local observatories hosted 14 universities. Its main thrust is on infrastructure and cities. The networks' focus on infrastructure is on how to make it adaptable, resilient, reliable, affordable, robust and sustainable. Its thrust on cities centres on how to make them healthier and more sociable (UKCRIC, 2019). Therefore, the network of local city observatories collect data which is concerned on achieving these set objectives. Emphasis on infrastructure and cities is logical as the two are interconnected. Infrastructure is required to move people, goods and services through the city. Further to this, the network of observatories is tasked to facilitate the UK government's industrial strategy which focuses on transformation, mobility, happy and healthier living for all, clean growth and the impact of artificial intelligence on the economy.

Operationalising Urban Resilience: A Review of Current Global Approaches

Urban resilience is characterised as the structural property of an urban system and is related to the system's capacity to continually self-organise and adapt to ongoing shifts. Operationalising resilience is arguably one of the most impactful global issues for future research as it implies linking the concept about what urban resilience is and what urban resilience ought to be (Caldrice, Brunetta, Tollin, 2019). With more than half of the world's population now

living in urban areas coupled with the increased frequency of natural and man-made disaster, understanding and operationalising urban resilience is now a global priority. The global resilience drive is currently based on a two-tier approach. The first and most common approach is top-down policy and framework formulation. This is done at global, regional and national level. The second approach, primarily adopted by communities with good social network infrastructure is the bottom-up participatory approach.

Top-Down Policy and Framework Formulation

The last five years have seen major global resilience policy initiatives being devised. On the 1st of January 2016, the 17 sustainable development goals of the 2030 agenda for sustainable development adopted by world leaders in September 2015 came into effect (United Nations, 2019). Sustainable development goal number 11 was to make cities and human settlements inclusive, safe, resilient and sustainable.

To complement the 17 sustainable development goals, UN-Habitat launched the City Resilience Profiling Programme (CRPP). This programme supports local governments to build capacity for improved resilience through the use of comprehensive integrative urban planning. It also provides tools for measuring and profiling resilience for all types of hazards (UN-Habitat 2019). Apart from the resilience profiling programme, UH-Habitat also developed the Urban Resilience Hub, a website which provides knowledge, solutions and tools designed to share resilience strategies globally. Some of the tools developed under the resilience hub are the Quick Risk Estimation (QRE) and the Disaster Resilience Scorecard (DRS). In 2017, the World Bank also came aboard the urban resilience drive by establishing a city resilience programme that empowers cities to pursue infrastructure investments that build greater resilience to climate and disaster risks (World Bank 2019).

Bottom-up Participatory Urban Resilience Approach

Although climate stresses are a global phenomenon their responses are reflective of local contexts. One of the most common features of global south governments is their capacity and resource limitations. Therefore, Urban Resilience adoption plans and policies must be designed according to local institutional strengths and civic participation. Pivotal to the success of these plans is the engagement of local actors. While current literature

addresses the motivators and enablers for urban adaptation planning and policy making, scholars and policy makers have not paid enough attention to the role of civil society and other non-state actors in participating, facilitating, and implementing adaptation options over time (Ruth & Coelho, 2007). A study carried out between 2008 and 2014 (Chu, Anguelovski, Carin; 2016) compared two case communities to establish the benefits of the top-down and bottom-up approach. Quito in Ecuador was cased for its bottom –up approach whilst Sarut in India for its Top-down approach. The Ecuador case found that the involvement of a wide variety of local actors and institutions produced positive results in the short term. The Sarut, India case showed that the top-bottom approach inhibits the community ability to pursue immediate participatory approaches.

The critical role of local Agents in Urban Resilience

Instead of focusing on discrete measures to adapt to specific perceived future climate risks, it may be more effective for cities to consider the problem as one of building resilience (Tyler, Moench, 2012). The global south is characterised by rich bio-diverse ecosystems which responds quicker to climate shifts. It is thus important to have both top-bottom and bottom-up approaches to implement resilience strategies more effectively. Local agents can be developed to be "first responders" as they possess local knowledge systems and due to this fact can negotiate, analyse and produce swifter, strategic responses. They do not need to rely on long chains of communication and in an information age can disseminate practical knowledge faster to local communities

The Fourth Industrial Revolution and Shifting Global Perceptions

Humanity is in the Fourth Industrial Revolution (4IR), an age in which scientific and technological breakthroughs are disrupting industries, blurring geographical boundaries, challenging existing regulatory frameworks, and even redefining what it means to be human (World Economic Forum; 2019). It brings together digital, biological and physical systems. One of the consequences of this merger is that it has the potential to make inequalities visible and to make them less acceptable in the future (Peter Maurer; President ICRC, 2016). This has largely been brought about by the rise of the Infocracy.

One of the most important disruptions that the fourth industrial revolution has brought about is the emergence of Infocracy. Infocracies are defined as systems or organisations whose operations are based on the flow of information (www.wiktonary, 2019). These systems depend on digital platforms which support informational transactions and communication between community members. Infocracies have the distinct advantage in that they are self-dependent, foster a strong sense of community, allow for the exercise of free choice, are designed to be relevance oriented, flexible and transparent. Infocracies started out as purely social platforms, evolving to cater for professional needs and now with the emergence of block chain technology, it is only a matter of time until these systems agglomerate into new models of social self-governance.

The nature of the existing urban system is under threat from the advances of the Fourth Industrial Revolution. The traditional concept of the urban structure depends of democratic systems of local governance and bureaucracy to deliver developmental programmes and objectives to communities. In this system, communities depend on representatives to communicate their needs and desires up the hierarchy to central authorities where decisions are made. Communication in the democratic system is two way between the top and bottom structures. In this system, all hopes and dreams of the individual and community are tethered to the bureaucracy within the democratic structure. The assumption has always been that the success of the democratic system equates to the success of the individual or community and the failure of the system also equates to the failure of the individual and community.

Enter the Forth Industrial Revolution and infocracies and the situation is transforming. The emergence of infocracies has allowed for individuals to create their own communities which cater for their needs without as much dependency on the democratic system and its bureaucracy. These cluster communities have the distinct characteristic in that they endeavour to cater for their own needs through information provided within or by cross connecting with other communities both locally and internationally. Infocracies are strongly redefining how virtual and physical space is being used and have drastically impacted on the form and functioning of existing urban systems and their democratic processes. These digital networks are defying traditional spatial and economic models with large volumes of information and trade being done through these platforms. Companies such as Visa, MasterCard and digital currencies like Bitcoin and Etherium are key

drivers in this sector. In an information age, infocracies in most instances have access to more relevant information which can help community clusters than the traditional democracy and its bureaucratic systems.

THE FRAMEWORK OF THE 4IR URBAN OBSERVATORY

Future Dimensions for Spatial Planning Practice

To enhance resilience within the urban systems of Zimbabwe two new concepts inside the local spatial planning terrain have to be explored. Spatial planning in its definition is the professional practice that creates *places* where people can exercise their free will to fulfil their needs. With the advent of the Forth Industrial Revolution another dimension must be added to the definition, this dimension introduces the informative component to spatial planning. One gross injustice in today's modern community is not a lack of freedom but a lack of understanding of the basic human needs throughout the entirety of life. There is an assumption that communities inherently know the basic human behaviour drivers and how to fulfil their needs. In this digital age, information has the power to change lives. Thus, current and future spatial planning practice must set out to inform and educate communities about basic human needs and how they can be sustainably achieved within urban systems. The second concept concerns the palatability of spatial planning knowledge to the citizens. Current explorations of spatial planning knowledge are largely confined to academic and professional circles with the generality of citizens having virtually no understanding of spatial planning terms, products or services. Thus, current and future spatial planning practice must set out to make spatial planning knowledge and practice palatable, informative and relevant to all citizens.

The UZ-DRUP Urban Observatory

With distinct advantages in population numbers, physical environmental quality, existing digital backbone infrastructure and literacy, a developing country such as Zimbabwe is uniquely positioned for integration into the Fourth Industrial Revolution. To transition spatial planning in Zimbabwe into this digital age, a specific tool is required that will focus on the development of future urban systems, planning professionals and communities. This is the proposed UZ-DRUP Urban observatory (University

of Zimbabwe-Department of Rural and Urban Planning Urban Observatory). The Urban Observatory will focus on three distinct areas which when combined will contribute to enhancing urban resilience in the country. These three areas are urban functionality modelling, professional development and future communities' development. The informational back-bone of the Urban Observatory will be based on the following data:

- *Geo-physical data*: This will be data on geology, hydrology, topography, ecology, volcanology and climatology.
- *Infrastructure and Land-Use Classification*: This data will show major urban infrastructure and designated land uses with urban boundaries.

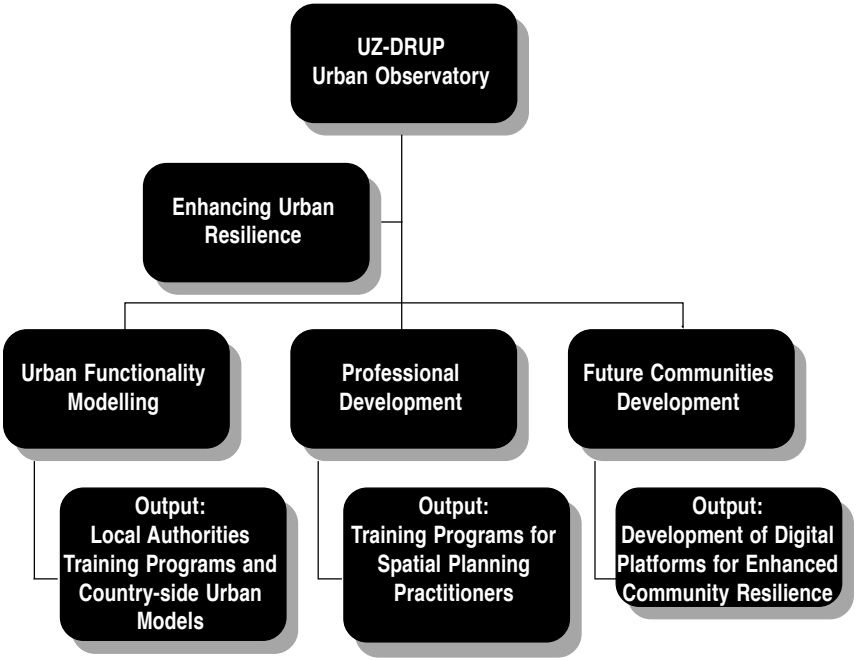

Figure 2: Structure and Function of the UZ-DRUP Urban Observatory (Author, 2019)

Urban Functionality Modelling: This strategic unit of the Urban Observatory will focus on developing spatial planning models that explain how urban centres in Zimbabwe are currently functioning. This modelling will be based on the following data sets:

- Human needs
- Urban Culture
- Principles of intelligent urbanism
- Sensory perception
- Existing operational urban ideologies

Once these base models have been developed, concepts such as 4IR, Urban Resilience, Common Good Economics, Climate Shift and Gross Domestic Happiness can be applied to improve them and create future road maps. Strategic partners for this endeavour will be local authorities' country wide.

Professional Development: This strategic unit of the Urban Observatory will focus on the development of in-training and post- training spatial planning practitioners. It will train practitioners on trending developmental topics such as 4IR, Urban Resilience, Common Good Economics, Block Chain, Climate Shift and Gross Domestic Happiness. The strategic partners for this unit will be current planning students, qualified practitioners and national spatial planning professional institutions.

Future Communities Development: This strategic unit of the Urban Observatory will focus on community education and information dissemination. The aim is to develop more informed communities that are aware of human need dynamics, the role of spatial planning in urban development and its relation to their livelihoods. Using digital platforms, urban communities will be informed on human need dynamics, 4IR, Climate Shift, Principles of Common Good Economics, Block Chain and Gross Domestic Happiness as it applies to them. In developing future communities, the urban observatory will look to work with the new generation of 4IR change agents. With the greater access to information, the global community is now looking to a new breed of change agents, change agent that embrace the use of infocracy and information as the basis upon which their endeavours depend. Gone are the days of financial moguls whose sole focus was the bottom of the balance sheet. Todays' most influential change agents are those that are making the planet a better place for the larger majority. These change agents cover a wide spectrum from countries, tangible physical products to individuals. Countries such as Bhutan with their Gross Domestic Happiness thrust are now pioneers in new socio-economic engineering. The Dali Lama and Pope Francis are shining beacons in a new thrust of practical spirituality. Innovators such as Manoj Bhargava with his 'Billions in Change'

drive are changing the lives of rural communities with their inventions and innovations. This is the new pedigree of change agents. Using this archetype, the observatory will disseminate practical 4IR livelihood development information to communities.

Info-Drive: The delivery Model for the Urban Observatory

The Urban Observatory will be designed on an Infocracy model and will be based on spatial planning data. Information will be packaged digitally and designed using a two-tier approach. The first set of data will be designed to be a Community Decision Support System (CDSS). This will be used by the public (individuals or groups) to access information pertaining to human need dynamics. This set of data will be free of charge. It will be accessed via digital applications, newsletters, podcasts and videos. The second set of data will be designed for the providers of spatial planning products and services (local authorities) and it will operate on a freemium basis. This means that all basic spatial planning data will be accessed freely whilst more specific data sets will attract a premium charge. Specialist consulting services will also be provided to public organisations and local authorities.

Critical Stakeholders

The proposed UZ-DRUP Urban Observatory is being developed in a digital age and thus the best model to utilise is the one based on infocracy. The idea is to create innovative relationships with identified stakeholders to facilitate the exchange of information and experiences through direct contact. The aim is to communicate directly with local communities through mediums that appeal to the current and future generation. This will be done through the use of a new breed of urban planners trained as 'information disseminators of the Forth Industrial Revolution'. The following are therefore the critical stakeholders:

In-Field Town Planning Practitioners: Zimbabwe has over sixty districts and the majority of these have urban planners who manage spatial development within the district. By developing training programmes that focus on urban resilience and new development paradigms the Urban Observatory can ensure that resilience knowledge is disseminated to local levels. There is also the distinct advantage that concepts of resilience and other new planning paradigms begins to be percolated into daily planning decisions at local level.

In-Training Town Planning Practitioners: Zimbabwe has a significant number of planning schools which can benefit from curriculum review and the introduction of seminars, courses and programmes that focus on matters of Urban Resilience, the Forth Industrial Revolution, Principles of the economy for the common good, block chain, new Urban Agenda and E-commerce just to name a few. The study of these concepts and how they are impacting existing and future urban forms is invaluable. The exploration of these concepts whilst training allows students to begin to cognise these ideas as possible future directions and as they transition into planning careers the application of this knowledge becomes automatic practice.

Relevant Global Development Agencies (UN-Habitat, WEF): Global development agencies have a wealth of knowledge and experience that can be useful at local levels of planning. One of the roles of the observatory will be to facilitate information exchange between global development agencies and local urban planning practitioners and in-training students.

Local Communities: One of the major functions of the Observatory will be to develop practical urban planning information for local communities. This will entail the design of local outreach programmes for various urban demographics. It will also include the identification and collaborative training of local change agents. In the development of more informed local communities, it is important to understand shifts in urban culture and develop programmes that are in current taste with new generations.

Private Sector Philanthropy: Some of the most influential drivers of the fourth industrial revolution are philanthropists. These exist in all communities and it one of the primary tasks of the observatory to identify and partner with them. This means that the Observatory must be developed into a structure that demonstrated integrity, goodwill and good ethical culture.

Innovative Countries in Urban Development: There is a lot to learn from countries that are leading the way in terms of innovative urban development paradigms. There are countries such as Bhutan with its GDH (Gross Domestic Happiness Index). There are cities like Buffalo in Americas New York State and their urban renewal approaches and countries like Austria with their concept of the economy for the common good. The digital age now allows for the creation of relationships over distance and linkages with such examples of global innovation will realise profound future results for Zimbabwe.

University of Zimbabwe- Department of Rural and Urban Planning (UZ-DRUP): With UZ-DRUP being the host of the urban observatory, it will

be critical that key human resources be developed and have firm grasp of current global, regional and local planning dynamics and trends. This will be achieved by specialised training that will focus on developing skills required to operate the urban observatory.

CONCLUSION

Game theory affords the opportunity to understand and contextualise urban resilience from a new perspective. It demystifies the players, shedding light on the nature of strategies involved, including their magnitude and time lines utilised. Urban systems of the future must put these considerations into context and develop models that accommodate the dynamics of ecosystems especially as it relates to physical infrastructure. It is clear now that the strategy employed by ecosystems is immense in magnitude and urban systems must now become fluid and adaptable to such phenomenon. Thus, the current use of terms like natural disaster or catastrophes simply demonstrate how unknowledgeable and unprepared humanity has been in playing the infinite game. Newton's third law of thermodynamics (Thomson and Tait, 1867) states that for every action there is an equal and opposite reaction. In the quest of meeting its needs, humanity must re-orient strategy and understand how its actions have responses (reactions) in the game scenario. To survive into the future, new paradigms of production, consumption and re-cycling must be adopted. The development of urban resilience has to be augmented by fostering better informed communities and the digital technologies of the Fourth Industrial Revolution will greatly assist in this regard. Today information is power. Better informed communities will make better decisions about their lives as they evaluate the greater number of opportunities' that will continually become available to them. With infocracy, global communities are now developing their own social structures and choosing a new caste of global leaders in the areas of science, education, philosophy, spirituality and economics to name a few. These digital communities are the new "nations" of the world with examples such as TED and Mindvalley leading the way. The ultimate quest of the Urban Observatory is to develop a platform through which cities and their inhabitants can access information that will assist in them to play the infinite game of life to the best of their ability. It is also the ideal tool through which global development goals can be realised locally and thus truly satisfy in the saying "Think globally, act locally".

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