Symbiotic Interdependence: A Systems Approach to Urban Poverty Alleviation and Sustainability

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This paper applies to the problem of urban poverty and particularly slums a conceptual framework based on systems theory. This conceptual framework provides a way of understanding the complexity and often-negative consequences of carefully articulated solutions to problems the are situated within extremely interrelated systems. Through a system theory approach, slums are characterised as a system- with particular components or features and the processes that perpetuate them. The framework also provides a conceptualization of sustainability that relates to the feedback characteristics of systems. According to the literal definition slums are 'sustainable', in that various characteristics operate in a mutually reinforcing process that maintains a cycle of poverty. Although slums are 'sustainable' they operate at a suboptimal level. This system needs to be changed so that the living standards of the urban poor are increased to a level considered adequate. In order to bring about appropriate and effective change to this suboptimal system, two key factors must be applied: Acknowledgement of the interdependence of systems before and after introducing change, and Applying solutions that create symbiotic benefits not just to the target system but the associated systems thus creating more robust and diverse relationships. Tenure security is identified as a key to slum improvement and poverty alleviation. Tenure security is a catalyst to a host of enabling opportunities for the urban poor. Within the systems framework, tenure security has the effect of generating a positive feedback system, whereby the processes within the slum system become mutually reinforcing, thereby lifting the living standards of the urban poor and in turn creating city wide improvements. Although this generates a positive feedback system that is inherently 'unsustainable' as it creates exponential growth, it is necessary to contribute to overall long term sustainability. Applying the literal definition of 'sustainable', 'to continue in a certain state, maintain at a constant level' then this level of sustainability must allow for a decent and adequate standard of living for all.

INTRODUCTION

We live in a world of gross inequalities. Globally US$92 billion is spent on junk food, US$66 billion on cosmetics and almost US$800 billion on defence. Yet one quarter of the world's population lives in severe poverty, unable to afford or gain access to the most basic necessities required for a dignified human existence. The reasons for this situation are as multidimensional and complex as the state of poverty itself. This paper focuses on one particular aspect of poverty - urban poverty, manifested as slums. The United Nations Human Settlements Programme (UN Habitat) estimates that one billion people live in slums or inadequate housing. This is projected to increase to two billion by 2020 if current trends continue and no measures are taken to address it. The aim of this paper is to identify a framework in order to help improve this situation of urban poverty and contribute to sustainability. The framework is based on systems theory. By analyzing slums through a systems framework it is possible to show that the cycle of poverty which creates and maintains the often inadequate and sometimes inhumane conditions in slums is actually 'sustainable', according to the word's literal definition: however it is a system that operates at a suboptimal level. Understanding slums as a system provides a way of positioning them in a larger urban, national and global context and identifies one process for changing that system and the consequences of those changes.

SYSTEMS THEORY

As we come to know more about the problems we face, be they on a local, national, or global level, the more complicated they seem to be. So often when we look to experts and technocrats for the answers to and an understanding of some of the more complex issues. This specialization creates a one-

dimensional view of the world rather than an understanding of the complexities of the problems and the views of different disciplines. In turn we create one-dimensional solutions or understanding. Both poverty and sustainability issues and problems are viewed in this way. Various disciplines such as social science, economics, political science, and ecology have their own perceptions and constructs. These issues however can never be fully understood by a single discipline as both poverty and sustainability cut across multiple dimensions reflecting the multidimensional nature of them.

Systems theory provides a practical way of deconstructing these complexities and so shows not only the scope and contributing factors of problems but, more importantly, the relationships between these factors.

Definition of 'System'
To begin this discussion it is important to first identify what a 'system' is. Kauffman (1980:1) suggests a system is simply, "a collection of parts which interact with each other to function as a whole". Systems theory perceives the world as an interrelated series of complex systems that operate in a complex web of cause and effect.

Characteristics of systems
A basic premise of systems theory is that everything is connected to everything else. If everything is connected to everything else, then introducing change necessitates that the implications of the change will be equally complex. The interrelatedness of systems ensures that the consequences of introducing change will be complex and unlimited. Systems theory thus conceptualizes the complexity of phenomena in the world we live.

Feedback is a key factor in understanding how systems function. It refers to the relationship between parts of a system and the processes that make up the whole system. It also therefore refers to the relationship between systems. Feedback is fundamental to understanding how systems operate. Feedback is the transfer of information between systems.

Feedback can be of two types: negative and positive. On the one hand negative feedback creates stability within a system. The interaction of the parts with the system as a whole inherently limits the processes of that system (Botkin, D; Keller, E, 1998). On the other hand, with positive feedback the initial output of the system leads to a further increase in output. It creates a situation of exponential expansion of the system. This situation is inherently unsustainable and left unchecked can lead to a collapse of the system (Wikipedia 2005).

It is important to note that there is nothing inherently desirable in either negative or positive feedback. Its value depends on the system concerned. Negative feedback tends to slow processes while positive feedback speeds them up. Both feedback responses can be utilized to bring change to systems; what needs to be determined is the level at which systems ought to operate.

INTRODUCING CHANGE TO A SYSTEM

Bringing about change to a system requires two factors to be applied. The first factor is interdependence. The interdependence of systems must be understood in two ways:

Interdependence before changing the system
During the previous discussion it has been suggested that systems are complex and interrelated, that they operate on multiple levels and are multi-faceted. This interrelatedness makes defining the boundaries of systems complicated. Systems do not operate in isolation but in interdependence with a multitude of other systems. Therefore, it is necessary to identify the parts and processes relevant to particular observation and determine the linkages. This involves positioning the system within the vertical scale, which will identify the component systems that make up the proposed system and the larger systems of which it is a part. The second dimension involves identifying the parts of the system that form parts of other systems. This gives an account of the complexity and relatedness in the broader sense. The relationship between systems depends on an element of reliance. Combinations of systems require each system to perform its individual function in order for the larger system to function. This is the interdependence of systems. A system is more than the operation of a series of parts, but is, in addition, interdependent on the larger system of which it is a part.

Systems are in a constant state of change, adapting to changes in the factors that contribute to them. In order to introduce change into a system, it is necessary to identify the particular system, its components and processes, and its relatedness to other systems at a specific point in time. This gives a point to work from. It then becomes possible to understand the processes at work and how they may play out over time.

Interdependence after changing the system
When factoring in change to a component or process in a system it is necessary to understand the relationship of that part or process to the greater system. System theory suggests that you cannot simply do one thing when introducing change to a system (Kauffman, 1980). Everything is related to everything else so change to one part can have many consequences. From those consequences other changes can occur, and so on. From a relatively insignificant change in the first instance can arise a multiplicity of consequential changes, intended or unintended.

Interdependence is the factor necessary for understanding the complexity before change and the consequential effects after change. The second key factor must then deal with maximising the desired consequences while acknowledging and minimizing the negative consequences.

The second factor is symbiosis. Symbiosis arises out of systems theory through the fact that one component of a system can be a component for another system. In this way there is a mutual benefit and interdependence inherent in systems. Symbiosis is about building on this interdependence and looking for solutions that do not only focus on the target system. Problems within systems are not isolated to the target system then, but related to the larger context and the component systems within the target system. Problems are multidimensional, therefore solutions must be also so.

As a way of addressing the complexity and interrelatedness of systems, changes to a system should have multiple positive outcomes that incorporate as many variables in the system as possible. Solutions to problems within systems may not be the ideal solution for a particular problem but should still go some way towards addressing it. The synergy created by incorporating multiple variables into solutions aids in strengthening the particular system to become more stable and more interdependent with the wider system.

THE SYSTEMS FRAMEWORK AND SUSTAINABILITY

Sustainability is a vague and ambiguous concept. Lacking any one specific reference, it is open to various interpretations. In fact *Sustainability Now* (2005) suggests there are over 300 definitions of sustainability. The extent of contested definitions necessitates an identification of what constitutes sustainability in order to progress into further discussion.

The Collins English Dictionary defines 'sustainability' as "to continue in a certain state, maintain at a proper level or standard" (2001). This definition suggests an ideal state of sustainability. However it does not consider what is to be sustained and at what level. It is precisely because of these two factors that the concept has been misused and corrupted. Sustainability is so often applied to a particular object or activity in isolation and little consideration is given to the position and relatedness to broader context.

A classic example of this is sustainable building. Construction using the most energy efficient, low embodied energy, renewable and environmentally friendly materials is often considered the essence of a 'sustainable home'. However a home is more than just a building. Consideration must also be given to the social, economic and cultural roles it plays. Factors include location; proximity to schools, employment or other relevant needs; cultural needs; affordability and most critically - can it be applied on a scale that meets the needs of the general population? The very concept of sustainability arises from the relationship between humanity and the natural world. On one side there are human needs and values that are considered basic and fundamental to a decent existence. On the other, the limitations of a finite world to provide the means to meet those basic needs and absorb the environmental externalities. The ideal sustainable state arises from the balance of human needs and environmental capacity "*maintained at a proper level or standard".* Sustainability then must comprise these two broad dimensions – human and environmental. One cannot be promoted ahead of the other; sustainability must incorporate both as interdependent parts of the planet.

The sustainability of a system is characterized by the negative feedback of the system. The negative feedback of multiple systems scaled up to the global system then provides the basis of sustainability.

THE PROBLEM OF SLUMS

An evaluation of definitions and criteria of slums by UN Habitat, from governments, local authorities and organisations involved in urban poverty issues, provides the following set of common characteristics that give a clearer picture of what constitutes a slum (2004):

- Lack of Basic Services
- Substandard Housing
- Overcrowding and High Density

- Unhealthy Living Conditions and Hazardous Locations
- Insecure Tenure

The United Nation Centre for Human Settlements (UN Habitat. 2004) defines slums as "a heavily populated urban area characterized by substandard housing and squalor".

The Development Context
The *Universal Declaration of Human Rights (1948)* sets out the fundamental human rights for human existence, particularly articles 17 and 25, which apply to slums. Through the MDG's, a global consensus and timeframe is outlined to meet poverty reduction targets by 2015: goal 7, target 11 refers specifically to slums.

SLUMS AND THE SYSTEMS FRAMEWORK

Slums as one system in the wider urban sphere are the focus of this paper. As a component, slums are a significant element of the urban scene in most cities in developing countries. An average of 43% of the global urban population lives in slums, so the influence on the city in many aspects is significant (UN Habitat 2004). The relationship of slums to the wider context is illustrated in Figure 1.

The level of system greater than slums is the wider urban sphere. This is the main determinant system of slums and where the main processes function. The power of change that rests with government authorities exists primarily at the city level. Larger social and economic forces are predominant at this level. Cities represent the driving forces of social and economic development. They are centres of power: economically, socially and politically. The interaction between these factors and slums represents aspects of feedback that reinforce slum conditions.

Systems above the urban sphere include the national and international. These two systems have a significant impact on the formation and reproduction of slums. At the national level the principle factor is rural–urban migration. Cross border migration is also a factor but not one considered here.

Figure 1. The Relationship of Slums to the World

Processes within slums
Within the slum system the key process is identified as the cycle of poverty. This has 4 primary elements[1]:

- Lack of affordable housing
- Unhealthy living conditions
- Insufficient employment and income generating opportunities
- Insecure tenure

[1] The cycle of poverty is the relationship between theses elements extrapolated from the UN Habitat *Global Report on Human Settlements*. The four elements are identified in this authoritative publication as key elements of urban slums.

These 4 key elements form a cycle of poverty that interacts with the characteristics of slums to form the cycle of poverty. These are illustrated in Figure 2. One element does not necessarily result in another but they all interact to create the conditions evident in slums. This cycle forms a negative feedback loop that maintains and reinforces the inadequate situation of the urban poor. These elements of the cycle of poverty interact to form a negative feedback in the following ways:

- The lack of affordable housing and available land for housing along with the numbers of the poor, results directly in overcrowding and leads to habitation of marginal lands in and around the city.
- Poor living conditions are the result of overcrowding and marginal land but also of insecure tenure and a lack of incentive and capability to improve living conditions.
- Insecure tenure limits the ability to plan and engage in employment and income generation, by using the house as a productive asset and investment. Inadequate housing provision result in the poor meeting their accommodation needs outside the formal sector via means that are relative to their income and capability levels. (UN Habitat 2004; Field, E 2005)

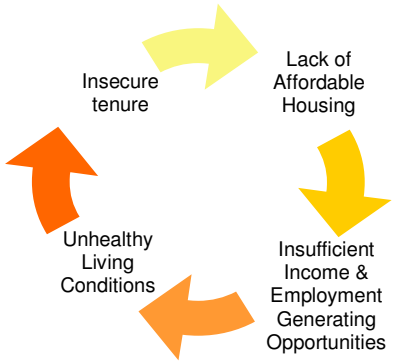

Figure 2. The Slum Cycle of Poverty

The Processes Between Slums and the Larger Urban Sphere

Building upon the previous section, Figure 3 shows how slum processes interact with the larger urban sphere in ways that reinforce the cycle and conditions of poverty. These include:

- Environmental Externalities
- Economic Exclusion and Exploitation
- Governance

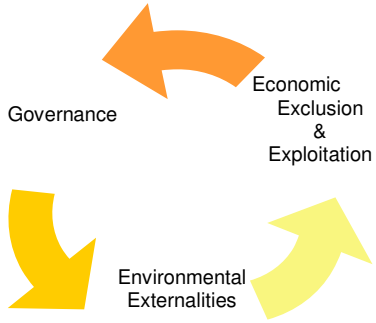

Figure 3. Slums and the Larger Urban Sphere

In addition globalization and rural migration are two further factors that impact upon slums but do not necessarily operate as a system within slums.

SLUMS AND SUSTAINABILITY

When viewed in isolation slums represent a sustainable system that operates at a suboptimal level. When considered in relation to the wider systems perspective with the interdependence of systems in

mind and the basic standards of human existence (as principally defined by the *Universal Declaration of Human Rights*, slums do not contribute to overall sustainability.

Slums thus represent an inadequate and sub-optimal system reinforced and recreated by negative feedback represented as the cycle of poverty. Environmental externalities, poor governance and economic exclusion and exploitation are three additional factors that also create negative feedback to this cycle from outside the defined slum system. Urbanization and globalization are also significant processes that impact on slums but not necessarily in a cyclical fashion.

As defined by the negative feedback, slums as a system are sustainable. However they are sustainable at an inadequate and sub-optimal level, as defined by the *Universal Declaration of Human Rights* and the MDG's.

TENURE SECURITY: THE KEY CATALYST TO SLUM IMPROVEMENT

Tenure insecurity was outlined previously as a characteristic of slums and a component of the cycle of poverty. Tenure security is identified as a key catalyst for slum improvement, not because it is an end in itself but because of the positive consequential options, incentive and integration that leads from it. Indeed Moser (1996) goes so far as to say that:

> …the removal of tenure security related obstacles that prevent or constrain households from using their housing as a productive asset is possibly the single most critical poverty reduction intervention.

Within the systems framework, the granting of tenure security is seen as the point of change. By altering this one element significant improvements to the slum conditions can be made.

What does Secure Tenure do for the Urban Poor?
The granting of secure tenure to the urban poor has been identified as a key poverty alleviation measure. This is illustrated in Figure 4. Secure tenure is considered a catalyst to a series of other possible improvements. These include:

- Planning and Investment
  At the most basic level, the removal of the threat of eviction allows the poor to plan and invest in terms of labour and time.
- Incentive
  Secure tenure provides the incentive to the urban poor to carry out improvements to their home and mobilise community action to create community-wide improvements.
- Investment, Collateral and Savings
  Granting ownership to land and structure allows the poor to use the economic potential of their property. The home is generally the largest investment for any household, and a key mechanism of wealth generation. As property values increase over time, investment in housing forms a security net and a form of savings (Jatfors, A-K 2003).
- Inclusion and Empowerment

The acknowledgement by the government and local authorities of the legality and permanence of the urban poor is "an essential prerequisite for access to citizenship" (UN Habitat, 2003).

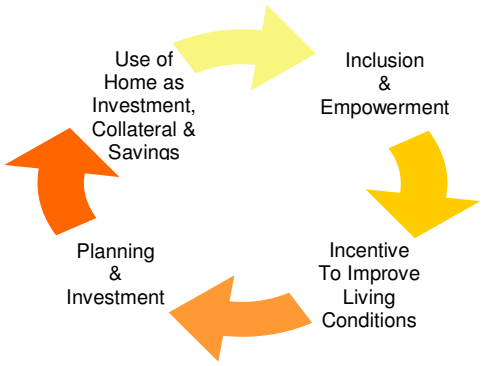

Figure 4. The Benefits of Tenure Security

POTENTIAL URBAN-WIDE IMPLICATIONS OF SLUM IMPROVEMENT

The positive consequential impact on the urban sphere includes:

- Formalization
- Taxation
- Economic Growth
- Healthier, More Productive Population
- Long-term Urban Development

The positive feedback cycle is illustrated in Figure 5.

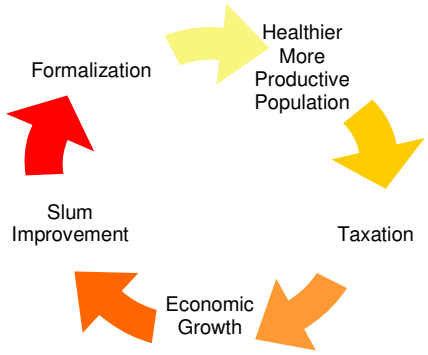

Figure 5. Positive Feedback in Slum Improvement

Negative consequential impacts potentially include:

- Increased Urbanization Incentive
- Environmental Degradation

Implications for Sustainability
No system can continue indefinitely when characterised by positive feedback. However in the case of slums, positive feedback is necessary to generate an adequate and optimal system determined by the development context. Sub-optimal systems may be sustainable but will not contribute to sustainability.

CONCLUSION

Systems theory represents a conceptual framework for assessing the complex and interrelated elements in our world. Two key aspects that come out of this mode of thinking are firstly that there is more to the world than a series of parts. The relationship between the parts is equally important. Secondly, everything is related to everything else – nothing exists in isolation. Understanding the relationship to the greater scale of which something is a part is a necessity to gaining an understanding of how it operates and how it impacts on the greater system. The sustainability of a system is characterized by the negative feedback of the system. The negative feedback of multiple systems, scaled up to the global system, then provides the basis of sustainability.

By defining the world as an interdependent series of systems with three key characteristics, a platform is provided for understanding complex problems. The second part–introducing change to system–looks at the factors and processes that must be considered to bring about informed and effective change to these complex systems. This is termed ‘symbiotic interdependence’.

The application of a systems framework to slums determines the components and processes both within slums and between larger systems. This reveals the interdependence and context of the system. The systems framework identified that slums operate as a negative feedback system which maintain the cycle of poverty. When applied in the context of sustainability, negative feedback prevents the urban poor from obtaining an adequate level of human habitation. This level is defined by the development context.

The modification of the slum system from one that is characterised by insecure tenure to a system where secure tenure is granted to the urban poor creates a catalytic effect, leading to slum improvement. Secure tenure allows the urban poor to plan and invest; provides incentive to undertake home and community improvement; enables the home to be used as collateral, investment and savings;

and grants inclusion and empowerment to participate in the formal sector. These factors form a positive feedback system within slums that enables the urban poor to gradually break out of the poverty cycle.

Secure tenure not only benefits the urban poor. The interdependence of slums systems with the greater urban environment, and the symbiotic considerations of secure tenure as the point of change, result in benefits across the larger urban sphere. These benefits are: formalization; a healthier, more productive population; taxation, and economic growth. The combination of these factors then creates a positive feedback system of growth and development within the urban sphere, leading to overall urban improvement.

Secure tenure is the catalyst for poverty alleviation, slum improvement and urban development. Application of secure tenure to the global urban population can therefore have significant implications for the alleviation of poverty worldwide. This positive feedback situation is inherently unsustainable in the long run, yet is necessary to alleviate urban poverty. At this point it becomes fruitless to consider the application of negative feedback to this situation given the developed world's present state and preoccupation with economic growth. The difficulty then arises in determining the level or point at which human systems (especially economic) can operate optimally creating stability between the component systems of the human and ecological spheres, and thus creating sustainability of the global system as a whole.

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