

**School of Design and the Built Environment**

**Slum Regeneration and Development of Sustainable Communities:  
A Case of Addis Ababa**

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**This thesis is presented for the Degree of  
Doctor of Philosophy  
of  
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## **Author's declaration**

I certify that to the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made. This thesis contains no material that has been accepted for the award of any other degree or diploma in any university.

The research presented and reported in this thesis was conducted in accordance with the National Health and Medical Research Council National Statement on Ethical Conduct in Human Research (2014) – updated March 2016. The proposed research study received human research ethics approval from Curtin University Human Research Ethics Committee Approval Number RD-31-14.



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## Statement of contributors

All of the written materials submitted as part of this PhD by Publication were conceived and coordinated by Zafu Assefa Teferi. I also undertook the majority of the writing and case study analysis for each publication.

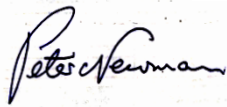
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## **Abstract**

Slum demolition and relocating approaches have increasingly become characteristics of daily life in Addis Ababa, Ethiopia, and the rest of the emerging or developing world. This traditional approach to improving slum settlements has failed to address the rapid changes that are occurring in urban life and appears to be inadequate in solving or alleviating the complex social and economic problems of cities such as Addis Ababa.

The aim of this thesis by publication was to examine the extent to which slum redevelopments have been successful in improving the socioeconomic and environmental quality of human settlements and the living conditions of the residents. It examined the sustainability outcomes of slum clearance high-rise projects compared to the informal settlements they are meant to replace. Sustainability was measured in two ways: through the Extended Metabolism Model, which looks at resource consumption, wastes and liveability outcomes; and, through the framework of Sustainable Development Goals (SDGs).

The study compared the sustainability of informal slum settlements in Addis Ababa with high-rise slum clearance apartments, using empirical data collected from three existing informal slum settlements and two slum clearance apartment sites to which slum dwellers have been relocated.

The results reveal that the informal slum communities are exposed to physical, socioeconomic and health hazards because of inadequate quality housing, inadequate social services provision and poor environmental sanitation conditions. It was evident that, despite the apartment dwellers having better housing quality and a clean, healthy living environment where people are less prone to poor sanitation and inadequate energy, they had lost essential community structures in the new buildings. The data obtained from the community shows that level of trust was missed in the high-rise complexes. The study recommends in-situ redevelopment as an alternative to the currently favoured slum clearance approaches.

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## **Dedication**

I would like to dedicate this thesis to all slum communities of Addis Ababa who are supporting their livelihood through hard work.

## **Publications submitted as part of this thesis**

Below is a bibliographic list of the publications representing the body of research for this PhD thesis.

### **Refereed Articles**

1. **Teferi, Z. A.**, & Newman, P. (2018). Slum Upgrading: Can the 1.5° C Carbon Reduction Work with SDGs in these Settlements? *Urban Planning*, 3(2), 52-63.
2. **Teferi, Z. A** and Newman, P., (2017). Slum Regeneration and Sustainability: Applying the Extended Metabolism Model and the SDG's, *Sustainability*. 9(12), 2273.
3. **Teferi, ZA.**, and Newman P, (forthcoming). Improvement of slums in Addis Ababa: Moving towards community-sensitive distributed infrastructure. *Urbanization*

### **Book Chapters (Peer Reviewed)**

4. **Teferi, ZA**, Newman, P., Matan, A (2016). Applying a sustainable development model to informal settlements in Addis Ababa. In: *Indian Ocean Futures: Communities, Sustainability and Security*. Kerr, T. and Stephens, J. (Eds), Cambridge Scholars publishing, UK.

### **Conference Proceedings (Peer Reviewed)**

5. **Teferi, ZA.** and Newman, P. (2014) Older Slums in Addis Ababa: How do they Work? 4<sup>th</sup> international conference on Informal Urbanism Proceedings, Cairo, Egypt.



## Conference presentations

6. **Teferi, ZA.** and Newman, P. (2014) Older slums in Addis Ababa: How do they Work? 4<sup>th</sup> International Conference on Informal Urbanism Proceedings, Cairo, Egypt.
7. **Teferi, ZA.**, and Newman, P. (2016) Indian ocean settlements: Lessons for sustainability. Re-Imagining Australia: Encounter, Recognition, Responsibility, Perth, Australia.
8. **Teferi, ZA.** (2016).The Application of Sustainable Development Model to Slum Settlements in Addis Ababa, Ethiopia. 9<sup>th</sup> international Conference on African Development: The Challenges of Good Governance and Leadership for Sustainable Development in African States, Addis Ababa, Ethiopia.

## Table of contents

Author's declaration.....	i
Statement of contributors.....	ii
Abstract.....	iii
Acknowledgments .....	iv
List of figures.....	xi
List of tables.....	xii
List of acronyms and abbreviations.....	xiii
Chapter 1 Introduction .....	14
1.1 Background .....	14
1.2 Ethiopian study context.....	16
1.3 Governance and socioeconomic challenges of Addis Ababa .....	20
1.4 Previous research studies in this area.....	22
1.5 Research questions and objectives.....	23
1.6 Objectives.....	26
1.7 Structure of the thesis .....	26
1.8 Justification and delineation of the study .....	29
1.9 Research significance.....	30
Chapter 2 Literature review.....	32
2.1 The notion of slum .....	32
2.2 Rapid rural-urban migration and slum formation .....	34
2.3 The incidence of slums in Sub-Saharan Africa .....	35
2.5 Urban metabolism and human settlements.....	38
2.6 SDGs and slum upgrading .....	40
2.7 From Millennium Development Goals to Sustainable Development Goals .....	41
2.8 Concept of urban upgrading.....	42
2.9 Slum upgrading approaches .....	42
2.10 Urban renewal or in situ upgrading? .....	45
2.11 Re-blocking approach and community development.....	47

2.12 New Urban Agenda .....	47
Chapter 3 Research design and methods .....	49
3.1 Research location and description.....	50
3.3 Observation and photography .....	51
3.4 Summary of methodologies for each paper .....	52
3.5 Selection of case study .....	53
3.6 Extended Metabolism Model Indicators .....	54
3.7 SDG Indicators .....	55
3.7 Analytical frameworks for the research.....	56
3.7.1 The Paris Agreement .....	56
3.7.2 Sustainable Development Goals.....	57
Chapter 4 Overview of publications.....	58
4.1 Publication 1 .....	58
4.2 Publication 2 .....	59
4.3 Publication 3.....	60
4.4 Publication 4 .....	61
4.5 Publication 5.....	62
Chapter 5 Conclusions and directions for future research.....	64

## List of figures

Figure 1 Schematic diagram of the thesis structure illustrating relationships among question, objectives and publications.....	28
Figure 2 Urban areas classifications based on legal status and physical Conditions .....	33
Figure 3 Proportion of the urban slum population around the world .....	36
Figure 4 The three-ring interpretation of sustainable development.....	37
Figure 5 Diagrammatic illustration of urban metabolism .....	39

## List of tables

Table 1 Summary of slum upgrading theories .....	45
Table 2 Selected sub-cities and settlements showing geographical locations.....	51
Table 3 Publications and methodology used .....	52
Table 4 Indicators of Extended Urban Metabolism Model .....	55
Table 5 Indicators of SDGs used in analysis .....	56

## **List of acronyms and abbreviations**

<b>CSA:</b>	Central Statistics Authority
<b>CO<sub>2</sub>:</b>	Carbon dioxide
<b>EDO:</b>	Environmental Development Office
<b>FDRE:</b>	Federal Democratic Republic of Ethiopia
<b>GDP:</b>	Gross domestic product
<b>MDGs:</b>	Millennium Development Goals
<b>NGOs:</b>	Non-Governmental Organisations
<b>SDGs:</b>	Sustainable Development Goals
<b>UN:</b>	United Nations
<b>1.5°C:</b>	1.5 Degree Celsius

## **Chapter 1 Introduction**

This thesis is organised as a collection of five published papers, each of which explores a different research question. The papers separately answer each research objective, but combined they make a cohesive study. As a publishing requirement for each journal and edited book, there are literature reviews, methodologies, analyses, interpretations of results and conclusions. This exegesis presents a general overview of the background of the study, the review of literature, methods and techniques of the whole research, while more details can be found in each publication. This preliminary chapter presents the overall background of the study, other research that has been carried out in the area and then presents and explains the research questions arising from this review. This is followed by a description of the project scope and objectives. Finally, this introductory chapter discusses the usefulness of this study as a new way of looking at the issue and its contribution to the body of knowledge and policy-making.

### **1.1 Background**

In 2003, there were an estimated 1 billion slum inhabitants worldwide; by 2020, this number is projected to double to 2 billion people (UN-Habitat, 2016). Urbanisation is a global phenomenon, sometimes leading to the dramatic growth of cities and urban districts that can stretch the resources of a city and its ability to provide sufficient adequate housing. In developing countries, informal urbanism emerges as a substitute for formal city growth to address these huge influxes of rural–urban migration of people. Currently, an estimated 72 per cent of urban residents in Sub-Saharan Africa live in such informal settlements (Hove, 2013). East Africa remains the least urbanised sub-region in Africa, with only an estimated 24 per cent of people living in urban centres. If that percentage changes, the proportion of informal settlement in Africa may well grow even larger (UN-Habitat, 2015).

Urban informal settlements have increased dramatically over the last four decades throughout major cities in developing countries. Postwar industrialisation, increased economic opportunities and social freedoms continue to drive rural-urban migration despite the challenging living conditions involved. In one example of this

phenomenon, approximately 80 per cent of Addis Ababa's 4 million inhabitants live in the city's slums ('*Yedekeku Menderoch*') or other types of informal settlements (Teferi & Newman, 2014; Tesfaye, 2007). These settlements are characterised by substandard housing conditions and a lack of essential services, because the governments of cities in developing countries like Addis Ababa do not have the necessary financial resources to provide better settlements (UN-Habitat, 2014).

UN-Habitat (2016) estimated that over 2 billion people live in urban regions in the emerging countries. In Africa, the Pacific and Caribbean countries, 70 per cent of urban populations live in slum settlements. The challenge is not just how to prevent future growth of informal settlements, but how to regenerate present slums in terms of providing adequate basic services, infrastructure and economic empowerment through job creation and general environmental quality (Mitlin, 2003; Banerjee, Bhawalkar Jadhav, Rathod & Khedhar, 2012).

There has been an evolution in policy responses to the slum challenge over the past 40 years, which will be expanded on later in this exegesis and which has become a key focus of the research papers. Slum relocation and clearance were once the conventional solutions based on a primarily negative attitude to slum settlements. This followed a modernist approach that was tried and rejected in most cities of developed countries, but which has now been adopted almost universally in informal settlements of developing countries. The obvious problem that has emerged is that the bulk of slum relocation high-rises have been pushed to the outskirts of cities where many economic and social services are not readily available (UN-Habitat 2010b).

The Universal Declaration of Human Rights, Article 25, proclaims that every person has the right to a standard of life that allows them to attain basic necessities for themselves and their families (Hannum, 1995). Unfortunately, cities cannot keep up with the rapid influx of people as they often lack adequate public facilities and eventually become overcrowded. As a result, most urban citizens rely on impermanent housing, or slums, which mainly provide substandard living conditions (UN-Habitat 2015).



## 1.2 Ethiopian study context

Currently, Ethiopia is among the least urbanised countries (20 per cent), but is undergoing a fast rate of urbanisation, at about 5 per cent per year (Oliver, 2014). The urban expansion experienced in Ethiopia is predominantly characterised by the proliferation of informal settlements, complemented by a high incidence of poverty and unemployment. What is remarkable is that the highest proportion of the urban population, around 80 per cent, is now living in slum settlements. Similarly, the level of development of urban informal slums in the country is one of the highest in the world. Consequently, a large number of houses in the country are below standard and lack acceptable space (Tesfaye, 2007). The range of delivery for water supply, electricity and drainage is insignificant (Duguma, 2016; Wubneh, 2013). This affects the wellbeing and health of the people who inhabit these dwellings. This situation will continue in the future unless significant progress is made in the housing supply along with an increase and improvement in the provision of infrastructure and services.

Most Ethiopian cities have been transformed from small, traditional, feudalistic military camps (*sefers*) into major urban centres (Wubneh, 1976, 1983). Urban settlements in the country are characterised by inadequate housing; even residential houses constructed by the government are often in poor condition. The huge presence of slums in Ethiopian cities is a result of a political dynamic that has historically constrained access to urbanised land (Gittleman, 2009; Haregewoin, 2007). In spatial terms, this reflects an enormously unequal economic structure. These settlements are various, ranging in location, density, size, building quality, legality and level of integration. Nevertheless, they all share some characteristics, such as lack of urban infrastructure, substandard dwelling conditions and separation from the formal city. This variation of settlements makes the formulation of urban policies and implementation more difficult.

The history of Ethiopian urbanism has itself been more about repeated attempts to demolish dwellings than about the search for solutions to improve in situ living conditions. Because of this inappropriate model, informal settlements were generally regarded as merely an urban problem to be solved by demolition. They did not fit with the image of a city that the ruling elites believed in. A number of slum

settlements were cleared and the population relocated to new housing apartments on the outskirts of the city. However, the slum problem did not disappear as people kept migrating to the city. They had to make their own housing from whatever material they could find, and usually in places that were illegal but available for squatting. Many of these places are decades old and remain without improvements.

Like other cities in the developing world, cities in Ethiopia have failed to accommodate growth within a formal, planned urban framework of dwelling policies and strategies. Therefore, only informal settlements have resulted, and with no formal addresses or approvals to improve their conditions there is no access to suitable financing to enable the establishment of better housing (Regassa & Regassa, 2015; World Bank, 2012, 2015). The most significant example of this can be seen in the primate city of the country, Addis Ababa. As the only large African city with no colonial legacy, Addis Ababa was established upon the fabric of an indigenous settlement. The indigenous urban structure hosts an urbanity featured by a 'mixture' – as it is commonly called in Addis Ababa – of economies, social strata and functions (Ejigu, 2012). The problem of proximity makes important concerns for the city's largely deprived inhabitants. Contrary to such distinctive quality and opportunity, though, Addis Ababa's policy-makers and planners, like other several African cities, have chosen in recent decades to undertake a radical transformation of the city in the modernist planning tradition, opting for slum clearance and the building of high-rise buildings, which are often well away from the original site (Ejigu, 2012).

The critical role of government housing in inner-city neighbourhoods can be seen by analysing its concentration in certain older neighbourhoods. By virtue of its history as privately-owned housing prior to 1974, all of these houses are old and situated in areas of the city that were built up before that time. The concentration of these houses makes any upgrading process even more complex, because issues of neighborhood-level planning may be combined with the issue of privatising those houses. In turn, any successful privatisation will be enhanced by upgrading or redeveloping private housing in the surrounding area (Davis, 2006).

According to Elias Alemayehu (2008), 'the slums of Addis Ababa can be classified into three categories:

1. Unplanned old inner-city tenements, mostly *kebele* housing which is occupied by occupants with a few tenure rights, and is very low quality infrastructure;
2. Formal outskirts squatter settlements erected on empty public land with little or no infrastructure and with uncertain tenure rights; and,
3. Inner-city squats with no tenure rights (*lastic biet*, literally plastic house); these are usually found in small pockets and occupy parts of vacant open spaces, public parks, squares, and as attachments to street fences and side fences'.

Despite the presence of a large number of slum dwellings in urban centres, only limited efforts to reduce urban slums through upgrading were made until the 1990s. There was, however, a program related to slum upgrading in Addis Ababa. Launched in the early 1980s, The Tekle Haimanot Upgrading Project was the first residential scheme in the city. The project was financially supported by the Ethiopian government and The World Bank and included nine neighbourhoods in a highly congested area where 73 per cent of housing was government-owned and of very poor quality (Abdulwasi, 2009; UN-Habitat, 2007). The infrastructure improvement program in the area was predominantly undertaken by the Environmental Development Office (EDO) and its branches at the sub-city level.

The objectives of the upgrading programs carried out by the environmental development office were (Tolon, 2008 in Tesfay, 2016):

- to create job opportunities for the urban poor and the unemployed, especially through labour-intensive methods for project implementation;
- to upgrade the infrastructure in order to improve the living conditions of the dwellers;
- to warrant community involvement in all basic infrastructure actions comprising project identification, project design and implementation;
- to empower the residents to manage upgraded or newly built infrastructure and services.

Non-governmental organisations (NGOs) also participated in the slum improvement activities in Addis Ababa. Most efforts were concentrated upon upgrading infrastructure and enhancing environmental sanitation within the slums. Like the government-driven upgrading projects, NGOs similarly promote public participation in settlement improvement projects. Therefore, the target communities are involved in all phases of NGO-funded urban development projects, including raising 10 percent of the total project cost. Only two or three NGOs have been running effective but limited housing improvement schemes (Elias, 2008, Tesfay, 2016).

Urban redevelopment on a massive scale, carried out as the primary urban development policy approach, is a relatively recent phenomenon in Ethiopia. The Filwuha Area Resettlement projects and Tekle Haimanot upgrading can be cited as examples of early upgrading projects in Addis Ababa. Recent renewal projects began with the development of Casanchis, the Sheraton Hotel and Dembel City Centre Renewal Projects. With the launch of an Integrated Housing Development Program in 2006 and the growing emphasis of government planning intervention on urban development, the scheme has been expanded to include numerous neighbourhoods of Addis Ababa and other major cities in the country (Asfaw, Zelueh & Berhe, 2011).

The Ethiopian government, in collaboration with its development partners, has thus begun to adopt policies and introduced a number of programs to solve the problems of present slums, as well as prevent emerging new ones. However, it is not clear whether they are actually improving the lives of those living in slum settlements. Perhaps the biggest issue underlying the slum policies and programs is whether slum clearance is able to help on all levels of environmental/physical health and social or community health. Unless both aspects are addressed, the policies will be unbalanced and could do more harm than good (Ngau, Philip, Mbilo, Mutua & Achieng, 2012).

### **1.3 Governance and socioeconomic challenges of Addis Ababa**

Addis Ababa is the capital city of Ethiopia and home to an estimated 4 million inhabitants, or about 30 per cent of the Ethiopian population (Aga, 2016). It is one of the world's fastest-growing cities (4 per cent per year), due to both rural exodus (40 per cent of the annual population increase) and fast-paced demographics (UN-Habitat, 2016). Due to its location in the centre of the country, as well as the relative neglect of other urban areas, the city accounts for most of the social and economic infrastructure of Ethiopia (UN-Habitat, 2008). Yet Addis Ababa faces great challenges in terms of development, notably in the areas of housing, infrastructure and employment. Also, inadequate governance prevents the municipality from addressing these issues in an efficient manner (Wubneh, 2013).

Good governance promotes the capacity of a government to get the respect of its citizens that determine its economic and social policies that facilitate harmony among citizens and institutions in order to foster sustainable development (Asefa & Huang, 2015). However, as with most developing cities, there are many developmental issues to be addressed in Addis Ababa. Physical planning and housing, as well as economic development and corruption, are the biggest issues the city has to deal with (Wubneh, 2013). As far as housing is concerned, most houses were built during the reign of Emperor Haile Selassie, before he was removed from power in the socialist coup of 1974. Under the ensuing Derg regime, all houses became the property of the state and were managed by *kebeles* (neighbourhood associations). Following the fall of the Derg in May 1991, the public housing system remained. The subsequent population increase, combined with the dilapidated nature of the housing stock, meant that housing conditions in Addis Ababa fall far below international standards; 80 per cent of the population lives in informal housing and most of the housing stock needs urgent upgrading. Only half of the urban structures have private or shared water connection, and 35 per cent of waste is not collected according to the government (Gebre, 2012; Regassa, Sundaraa & Seboka, 2011).

Disastrous housing conditions are the visible result of deep economic issues. Ethiopia's economy was historically based on agriculture, and the sector still provides 40 per cent of national GDP (Anríquez & Stamoulis, 2007). The country remains poorly industrialised and Addis Ababa has failed to absorb the constant flow of migrants into the labor market. Not only is the unemployment rate high, at an estimated 31 per cent of the urban population, but population growth is outpacing job creation growth (Argaw, 2017; Central Statistics Authority, 2012). Therefore, unemployment is very likely to increase. This downward spiral of poor economic performance and a degraded urban environment have to be comprehensively addressed. In addition, it needs to be addressed at the metropolitan level, given the amount of urban infrastructure that requires an upgrade and the large share of the population affected by poverty and unemployment.

Implementing a complex policy that successfully addresses both infrastructure and economic issues on such a large scale requires strong institutions. In that regard, Addis Ababa has several advantages. The city has a special administrative status (Proclamation no. 87/97); it is independent from the region in which it is located and it reports directly to the federal government. The proclamation allows the city to define its own organisation (UN-Habitat, 2007). Addis Ababa is divided in 28 *woredas* (sub-cities) and 328 *kebeles* (dwelling associations). Executive power is located at the city level. It is led by a mayor and is in charge of technical matters. The *woredas* are in charge of administering their region and providing support for the *kebeles*. The *kebeles* are in charge of managing day-to-day 'community mobilisation, neighbourhood improvement, and building code enforcement.

The regulatory framework is decentralised and calls for responsive management that is close to local issues. While de facto, the system faces challenges in terms of capacity and resources, as well as reporting and accountability. Most responsibilities are delegated to the *kebeles*, which do not have the financial and human capacity to carry them. In addition, the available resources do not meet the necessities of the city in regard to planning and service delivery. Also, *kebeles* and sub-cities are not in charge of revenue collection; they face hardships carrying out their tasks and reporting mechanisms are weak, all of which harms accountability (Bjerkli, 2013). In

order to begin overcoming these great challenges that face Addis Ababa, the primary issue to be addressed is improving governance.

Therefore, this thesis deals with one of the most challenging development issues in the metropolises of the developing world: improving the sustainability of communities who live in slum settlements. Addis Ababa is presented as a representative case of the emerging development paradigms aimed at improving the quality of life for slum dwellers through urban upgrading projects, with both environmental and socioeconomic integration. This also thesis explores the extent to which the slum redevelopments have been successful in improving the socioeconomic and physical quality of human settlements and improving the living conditions of the communities in a way that is consistent with principles that promote Ethiopia's progress towards achieving the kind of aspirations set out in its Sustainable Development Goals (SDGs). The thesis especially examines SDG goals 5, 6, 7 and 11 and in its own aspirations, as set out in documents such as *Vision 2025*, to achieve middle-income country status (FDRE, 2010).

#### **1.4 Previous research studies in this area**

The pursuit of slum improvement is not a new area of investigation, with earlier contributions made by academics such as Turner and Fitcher (1972); Okpala (1999); Imperato and Ruster (2003); Davis (2006); Gulyani and Bassett (2007), and, most recently, Frenzel (2016).

A number of studies have been conducted on the economic and policy perspectives of slum inhabitants (Dafe, 2009; Field & Kremer, 2006; Marx, Stoker & Suri, 2013; Pugh, 1991). However, very few have been carried out using a holistic approach to solve the challenge of those settlements (Burra, 2005; Turley, Saith, Bhan, Rehfuess & Carter, 2013). In Ethiopia, many studies (Alemayehu, 2008; Gossaye, 2001; Tarekegn, 2000; Terefe, 2005) have been conducted on slum improvements, with particular attention paid to their spatial dimensions. Their focus has always been on physical aspects such as housing, land, space and buildings. The studies have investigated transformational forces in the inner-city areas where space is more competitive. Very little is known about a holistic comparative study of the

sustainability of current slums compared with the favoured option of high-rise condominium apartments. However, in this thesis, the physical, social and economic aspects of slum improvement will be examined, along with their community structures. It is relevant to mention here that since Ethiopia is a traditional society, the day-to-day activities of the people rely heavily on their social networks and if policies are going to undermine this, then serious cultural disruption and psychological disturbance will follow (Aman, 2016; Yntiso, 2008). This issue is of significance across all rapidly growing, emerging cities.

### **1.5 Research questions and objectives**

The eleventh SDG of the United Nations, which deals with Sustainable Human Settlements, has as its target the achievement of a major improvement in the quality of life of slum inhabitants by 2030. To achieve this, there is an obvious and immediate need for the improvement of slum areas. The question is how? This thesis aims to examine the extent to which slum clearance redevelopments have been successful in improving the socioeconomic and environmental quality of human settlements, as well as the living conditions of the residents, consistent with the principles that promote national and local progress towards achieving the SDGs and its economic aspirations.

The overarching research question this study seeks to answer is:

How do we manage the physical, economic and social development needs of slum settlements while maintaining the community structures?

Answering this primary question required an investigation into several interrelated sub-questions, as outlined below.

#### *Sub-question 1*

To what extent have slum redevelopments been successful in improving the sustainability of human settlements?

This sub-queation examines the extent to which slum redevelopments have been successful in improving the sustainability of human settlements. It examines the sustainability outcomes of slum clearance high-rise projects compared to the



informal settlements they are meant to replace. Sustainability is measured in two ways: through the Extended Metabolism Model which looks at resource consumption, wastes and liveability outcomes; and through the framework of the Sustainable Development Goals (SDGs).

This sub-question is addressed in Publication 1: 'Slum regeneration and sustainability: Applying the Extended Metabolism Model and the SDGs'

### *Sub-question 2*

What are the main characteristics of slums in Addis Ababa?

This sub-question aims to assess the availability and accessibility of service facilities in Addis Ababa slums as a case study of any slums in emerging cities. The service facilities of slum dwellers are evaluated in terms of dwelling place, source of drinking water, sewerage system, electrification, latrine facilities, drainage system, garbage disposal and access to health facilities.

This sub-question is addressed in Publication 2: 'Older slums in Addis Ababa, Ethiopia: How do they work'?

### *Sub-question 3*

How do we manage the physical development needs along with economic and social development needs of these areas using a sustainable development framework?

This sub-question focuses on the utilisation of sustainable technologies, or frameworks, in increasing the liveability of informal settlements, or slums, in an urban slum in Addis Ababa, Ethiopia. This publication tries to resolve the ongoing issue of how to manage the physical development needs along with economic and social development needs of these areas using a sustainable development framework. It also explores case study data from present and improved slum settlements in Addis Ababa and the application of SDGs to slum housing, looking at the economic, social and environmental aspects of slums and assessing how they can be integrated into a set of policies.

This sub-question is addressed in Publication 3: ‘Applying a sustainable development model to informal settlements in Addis Ababa.’

#### *Sub-question 4*

Is there a technological solution to a more community-based approach to slum regeneration?

This sub-question seeks to compare the adequacy of service facilities and environmental characteristics of informal slum settlements in Addis Ababa with high-rise slum clearance apartments. Slum settlements need to address the economic and social needs of their residents, as well as improving their housing quality and physical infrastructure. This sub-question attempts to examine the extent to which these social and physical issues can be integrated, and what holistic solutions can be found. It examines whether new small-scale, distributed technology can assist slum improvement in situ and create a more community-sensitive distributed approach at the same time, using informal slums and slum clearance projects in Addis Ababa as the case study.

This sub-question is addressed in Publication 4: ‘Improvement of slums in Addis Ababa: Moving towards community-sensitive distributed infrastructure.’

#### *Sub-question 5*

Can the global agendas of 1.5°C carbon reduction work at the same time as enabling SDGs in informal settlements?

This sub-question places the Ethiopian study into a global setting, as all emerging cities need to address the global requirement to reduce carbon and to enable the SDG outcomes. Thus, this research objective seeks to examine whether it is possible to achieve zero carbon power cheaply while improving housing quality and social and economic opportunities, rather than destroying essential community structures. It examines the potential for new, small-scale distributed infrastructure such as roof-top solar panels and batteries, while maintaining the strength of informal community life. If implemented, this could achieve the required carbon

reductions for the 1.5°C agenda, as well as substantially achieving the SDGs. This is an important message for all emerging cities.

This sub-question is addressed in Publication 5: ‘Slum Upgrading: Can the 1.5° C Carbon Reduction Work with SDGs in these Settlements?’

Hypotheses were also formulated based on research questions and literatures on sustainable cities, the following hypotheses were formulated to be tested in this study:

- It is possible to achieve zero carbon while improving housing quality, social and economic opportunities; this could achieve the required carbon reductions for the 1.5°C agenda, as well as considerably achieving the SDGs.
- Improving housing quality and infrastructure should not necessarily destroy important community structures.

## **1.6 Objectives**

The prime objective is to explore how to improve the sustainability of slums in emerging cities like Addis Ababa. The sub-objectives of the study were:

1. to identify the socioeconomic and environmental features of slum settlements that would validate in situ upgrading;
2. to explore the current slums and understand how slum rehabilitation and resettlement projects work;
3. to provide an alternative approach to that currently being undertaken to upgrade slum settlements.

## **1.7 Structure of the thesis**

The exegesis provides an explanatory overview to this thesis. It includes a brief introduction (Chapter 1); presents the reader with a general background of the study by presenting the relevance of the problem and the background of the study, a literature review which has not been covered by other publications (Chapter 2); a brief description of research methods adopted (Chapter 3); a summary of the five publications (Chapter 4); and conclusions with recommendations for future work (Chapter 5). Finally, the full publications are annexed with this exegesis.

Chapter 1 provides an introduction to the research, and presents the reader with a general background to the study by presenting the relevance of the problem and the background to the study. It begins with a background on slum upgrading from the global perspective in general and contextual background specifically, followed by an explanation of the research questions. The chapter shows the usefulness of the study in terms of both academic research and policy-making.

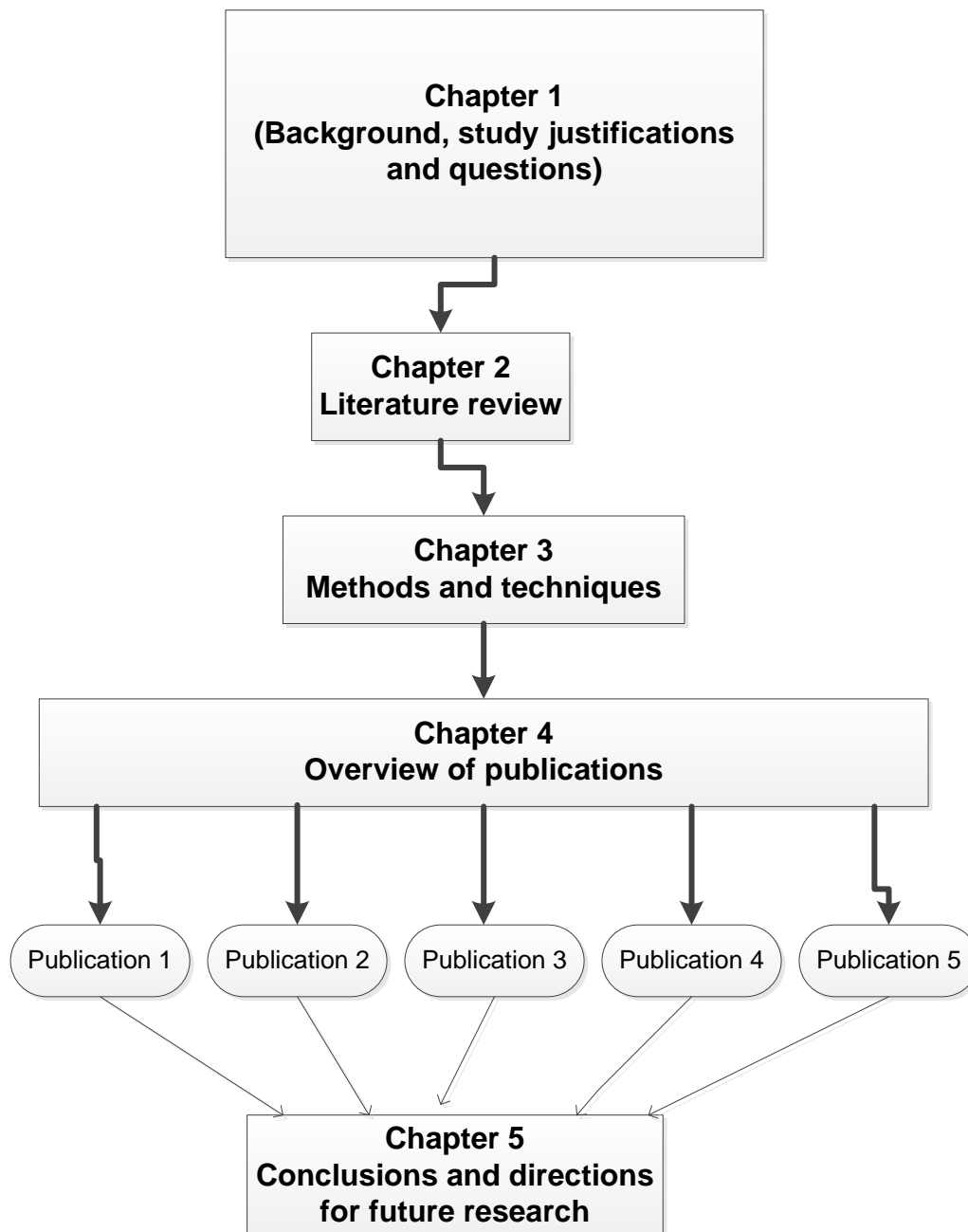
Chapter 2 reviews the literature on slum upgrading theories that published over time in the Global South. This chapter aims to shape a concept of the occurrence of slum development by reviewing differing theories and contemporary literature. It begins by outlining the subject, and then presents the incidence of slums in developing countries, followed by a review of theories of upgrading that have been developed over the years. It then focuses on approaches used to solve the situation of slums.

Chapter 3 presents and explains the perspectives and methods used to answer the research question, as derived from the literature review and theoretical premises. It deals with the issue of the data collection methods used in this research, followed by a description of the study sites and selection criteria. Finally, the indicators used for the analysis are explained.

Chapter 4 presents a summary of each publication. It summarises each of the publications presented for this study.

Chapter 5 presents the conclusions and recommendations for future research. It addresses the central issues set out at the onset of the study and relates them to the overall research findings. Furthermore, the possibilities and directions for extending and broadening the study are described.

**Figure 1 Schematic diagram of the thesis structure illustrating relationships among question, objectives and publications**



## **1.8 Justification and delineation of the study**

The fact that the problems created by slum settlements are still growing, indicates that it is imperative governments of developing countries give greater priority to programming and managing sustainable urban development. The complicated nature of living situations in these slum settlements needs policies and strategies to be devised that go further than the provision of basic infrastructure. Efforts to deal with these problems through massive relocation and the provision of social housing have proved to be of little success.

The policy significance of this research was emphasised by the need to search for a solution to the current slum conditions and the inability of the responsible actors, mainly the government, to eradicate the problem in Addis Ababa. The significance of the study had become critical since most of the preceding and current policies to solve the slum challenges have had minimal success. Slum policies play a vital role in poverty reduction efforts at city level and at the country level, as poverty is increasingly urbanised. Unfortunately, slum policies have not always been expressed along with poverty reduction efforts. In the early 1970s most local governments employed 'eviction' policies, which led to the demolition of housing structures and the eviction of slum inhabitants. These kinds of policies were very short-term, with people sometimes simply waiting for the bulldozers to leave before starting to rebuild their houses. The only effect was to lead to a further impoverishment of slum dwellers who lost the little physical capital they might have had (Restrepo Cadavid, 2011).

This thesis highlights the relevance of the discussion on 'renewal or slum upgrading' and its relevance in a specific case study of one of the world's cities with a high level of slums, namely, Addis Ababa. Geographically, the study was located within the administrative boundaries of Addis Ababa city administration. This area had a wide selection of settlements that could potentially serve as suitable sites for the investigation. Contextually, the study explored the physical social, economic and community sustainability of five slum communities in Addis Ababa.

## **1.9 Research significance**

The complexity of the investigation undertaken for this research required the adoption of a mixed methods design and approach. The investigations drew on a wide range of literature, methods and techniques. This study affirms some assertions, challenges others and contributes to the body of knowledge on the issues researched within an Ethiopian urban context, but with relevance to any informal settlement. Following are some of the significant contributions the research has made to the broader literature.

This thesis contributes to the body of knowledge and literature on a comparative study between present and renewed (relocated) slums and improved living, social and environmental conditions of low-income urban dwellers. The main framing of the data collection was to see how sustainability relates to informal settlements using two theories. The first is to apply the Extended Metabolism Model of Newman, which has been posited as a good way to examine the notion of sustainable development in cities (Newman & Kenworthy, 1999). This model is increasingly used for developed cities seeking to create a more circular metabolism (Newman, Beatley & Boyer, 2017), but has not been applied to emerging cities. The other major framing is the Sustainable Development Goals (SDGs), which have been set up and recognised by global consent, but have not yet been researched to see how they are integrated and how they can give perspective on how future cities become more sustainable with their complex issues of economic development, environment and equity (Sachs, 2015).

Thus, this thesis explored and evaluated the application of sustainability on the status of informal settlements in Ethiopia, particularly Addis Ababa, and suggested that these represent an addition to global knowledge as they examine settlements unlike most of the developed world and certainly rarely studied in terms of their future as a settlement form worthy of developing rather than clearing.

Furthermore, the results of this thesis could constitute the starting point for future research, since some of the difficulties encountered in the course of this research, for example, the lack of baseline data for comparing and analysing the effects of relocation, will hopefully be filled by this research.

Moreover, this research contributes to the knowledge of sustainability by providing a strong empirical foundation for discussions and a basis for making a detailed social and economic assessment of liveability for the slum communities of emerging cities. In the past much of the debate about slums was purely about their aesthetics, which has been a challenge for planners and architects from the Global North.



## **Chapter 2 Literature review**

This chapter presents a review of literature on slum upgrading and sustainable development of communities from a developing world perspective, which has not been addressed by the five papers. A systematic literature review was conducted with the aim of identifying the gap that exists on the topic. The detailed literature reviews on each subtopic in this section are included in each publication. This chapter aims to impart an understanding of how slums have developed, along with a review of theory and recent literature on the topic. It begins by defining the subject, and then describes the Extended Metabolism Model and its relevance to slum application. This is followed by a review of theories of upgrading that have been established over time. The chapter then focuses on approaches used to solve the situation of slums, including SDGs and the global agenda adopted in 2016, to help solve the issues of informal settlements.

### **2.1 The notion of slum**

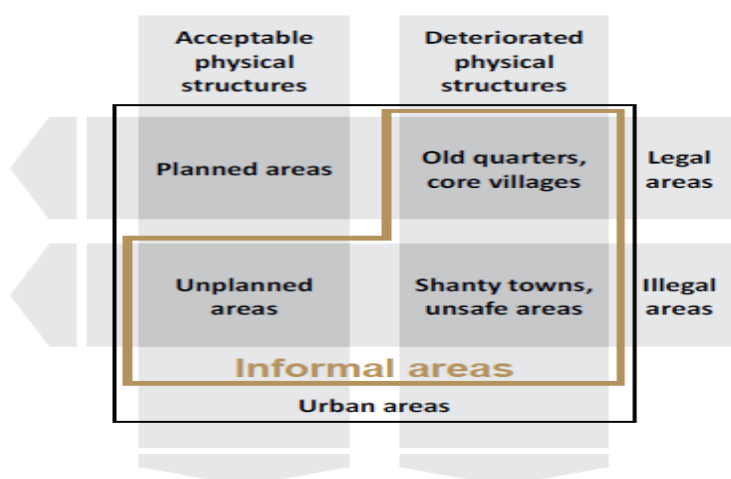
The word 'slum' was originally used to refer to the overcrowded and neglected inner-city tenements of European industrialised cities dating back to 19<sup>th</sup> century (Gilbert 2007). Slums, shantytowns, favelas and yedekeku menderoch are all different terms that designate one of the most common human settlements in urban history, and a feature of cities in the Global South: slum settlements. But what exactly are slum settlements? According to UN Habitat (2009), slum inhabitants are those residing in housing with one or more of the following conditions:

- poor structural durability of a dwelling
- overcrowding
- insufficient drinking water
- inadequate sanitation
- insecurity of tenure.

The definition of slums adopted in this thesis is based on the UN-Habitat Expert Group Meeting on slum indicators, which described slums thus: ‘A slum is an adjoining settlement where the dwellers are characterised by lack of basic services (sanitation, water, waste collection, electricity supply, surfaced roads, road lighting, and rainwater drainage), substandard housing, overcrowding and high density, unhealthy living conditions, and insecure tenure’ (UN-Habitat, 2003b). As illustrated in Figure 1, a slum is often not acknowledged or addressed by the government authorities as an equal or integral part of the city (UN-Habitat, 2003b, 2010b).

Slums are a result of a lack of planning and management, whether it is by the government, urban inhabitants, or both (IMUNA 2015). Environmental factors, such as severe weather and availability of resources, also need to be taken into consideration. People with low incomes do not have enough money to consider or improve the way they currently live, especially if they cannot claim ownership of the land they live on. Subsequently, developing countries must find a balance between creating sustainable, permanent housing for urban slum dwellers and the cost of building new housing. The definition of slums also includes squatter settlements, which are usually called ‘informal settlements’ to reflect their illegality (see Figure 2). These are residential dwellings created by the illegal occupation of land and are largely in breach of official building regulations (Arimah & Branch, 2011).

**Figure 2 Urban areas classifications based on legal status and physical Conditions**



Source: Participatory Upgrading of Informal Areas in Egypt, (2010).

## **2.2 Rapid rural-urban migration and slum formation**

The numbers of urban inhabitants is rising rapidly in several developing countries, especially Africa and Asia (UNDESA, 2014), which are the least urbanised continents in the world. Despite technological developments that can make physical vicinity less significant, and the pollution and congestion that result from the huge concentration of people, people still choose to live and work together in metropolitan and medium-sized agglomerations. Cities have been a driving force of economic growth, innovation and opportunity for many decades (Glaeser, 2011).

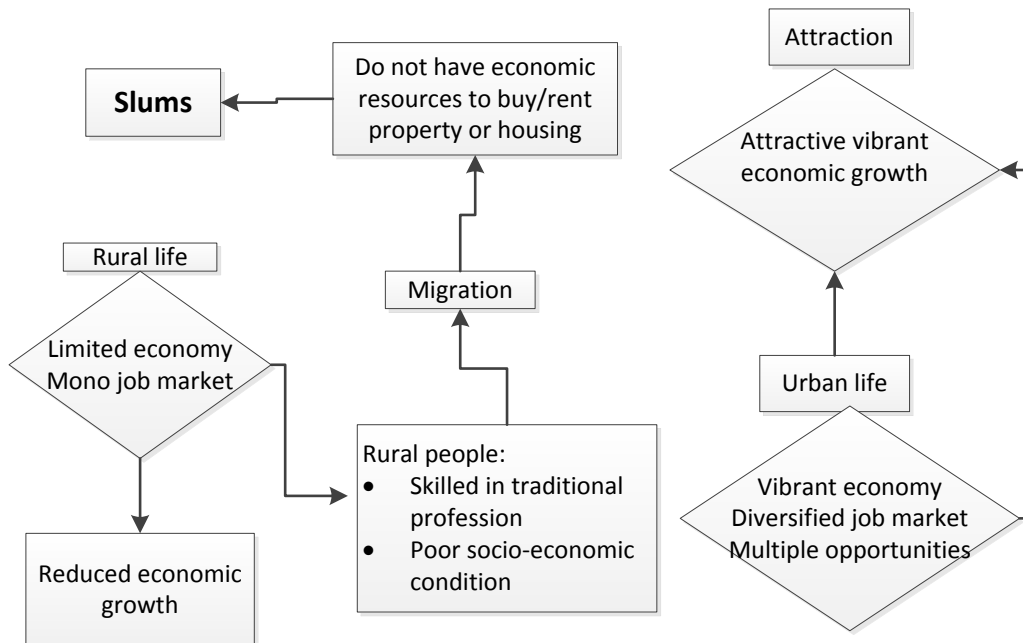
Slums have appeared and grown in many different parts of the world for a number of reasons: poverty, rural-to-urban migration, poor planning, high unemployment, bad governance and natural disasters (Beall, Crankshaw & Parnell, 2014; Fox, 2014; Lemanski, 2011; Stokes, 1962). Approaches used to reduce and redevelop informal settlements in many countries have had different levels of success, taking into account a combination of slum relocation, slum removal, slum upgrading, public housing projects and urban planning with citywide infrastructure development.

Since 1950, the number of people depending on agriculture in developing countries has declined by 20 to 30 per cent (Cervantes-Godoy & Dewbre 2010). This has resulted in migration from rural areas to cities in order to gain real economic opportunities (see Figure 3 Migration from rural regions). Such migration accounts for about 60 per cent of urban residents and, in exceptional circumstances, nearly 75 per cent (Todaro cited in Hove, Ngwerume & Muchemwa, 2013). There are no immediate employment opportunities in cities without the existence of some capital, hence the majority of rural migrants move straight into informal settlements where they usually have family and friends to protect them and give them support.

Prospects emerge partly as a result of the expanding informal sector in the urban economy, which most notably exists in the many large-scale urban slum settlements. In some cities, the informal sector accounts for around 60 per cent of employment of the urban population serving the needs of a large proportion of the population through the provision of goods and services, even if these workers are not recognised as being part of the formal economy (Brown and McGranahan, 2016).

Some of the world's biggest cities, such as Calcutta, Mumbai and Bangkok that are populated by over 10 million people, have between one-third and one-half of their populations living in slum settlements (Sovacool & Brown, 2010).

**Figure 3: Rural–urban migration interface**



Source: Adapted from Chattopadhyay and Biswas (2010)

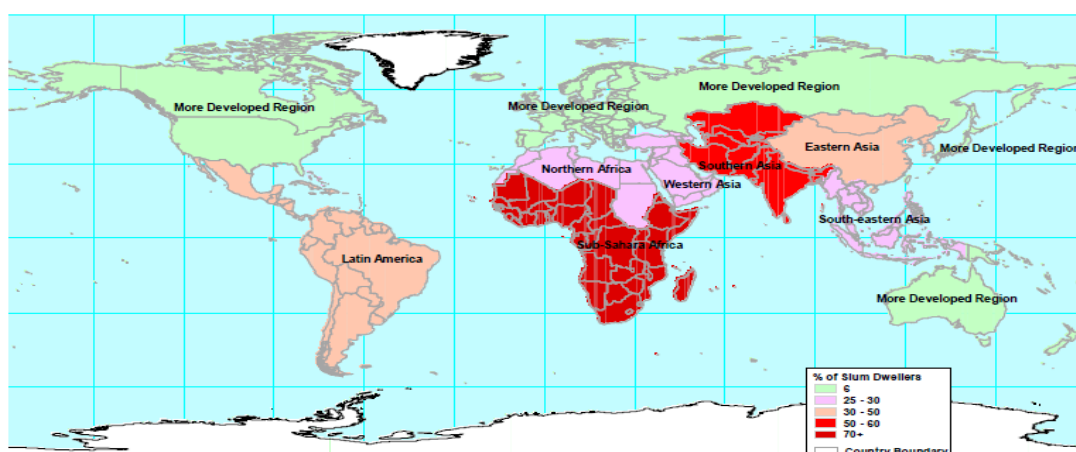
### 2.3 The incidence of slums in Sub-Saharan Africa

Sustainable urbanisation could help pull Africa out of its persistent poverty, as has occurred in developed nations and emergent middle-income countries all over the world. Nevertheless, Africa's urban turning point (greater than 50% urban), which is predicted to take place in 2035, would turn into a blight if the existing urbanisation accompanied by growing poverty, poor planning and governance, poor infrastructure, basic facilities and deteriorating health outcomes are not sustainably addressed (Chirisa, 2008; Jiboye, 2011; UN-Habitat, 2010b). If this situation is not addressed, it is hard to see how Ethiopia and other African countries confronting similar challenges can achieve their SDGs and be transformed into middle-income countries, as per their specified national plans and aspirations.

While the rapid pace of urbanisation experienced by African countries over the last three decades certainly plays a vital role in slum formation, there are other economic, social, political and institutional reasons for it. The impact of this is not fully known as they have not been the focus of rigorous empirical investigation (Arimah & Branch, 2011). The 2009 UN-Habitat *Global Report on Human Settlements* describes the urbanisation rate in Sub-Saharan Africa as being faster than for any other continent. However, Sub-Saharan Africa has only begun its urban transition in recent times; the increase is such that it is projected it will have an urban majority by around 2030. In keeping with comprehensive historical developments elsewhere, rural-to-urban migration in Sub-Saharan African countries appears to be the only significant cause of rapid growth of the urban population.

In the early 1990s, it was Southern Asia followed by Eastern Asia that had the highest proportion of slum occupants in the world, having some 180 and 159 million slums dwellers respectively. Today it is Sub-Saharan Africa that is taking the lead, having almost doubled its slum population in the past two decades (Restrepo Cadavid, 2011). Between 2000 and 2010, four of the world’s developing regions were successful not only in reducing the percentage of their urban population living in slums, but also the absolute number of slum dwellers. The most troubling trends are present in Sub-Saharan Africa.

**Figure 3 Proportion of the urban slum population around the world**



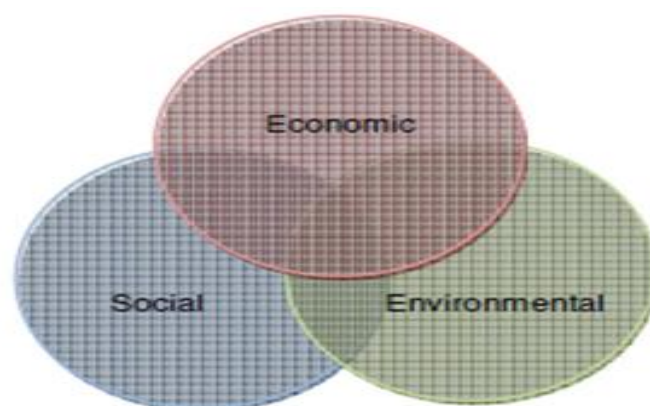
Source: UN-Habitat, 2015

According to UN-Habitat (2015), a total of 227 million people moved from slum conditions between the years 2000–2010 worldwide. Within the same period, the proportion of the urban population living in slums in the developing world declined from 39 per cent (2000) to an estimated 32 per cent (2010). However, the numbers of slum dwellers increased considerably. Despite exceeding the Millennium Development Goals (MDG) target - improving the lives of at least 100 million slum dwellers by 2020 by more than 2.2 times 10 years in advance - the situation still remains grim (Ngau et al., 2012). Hence, the progress made on the slum target has not been enough to counter the demographic expansion of informal settlements in the developing world.

## 2.4 Applying sustainable development to slums

The notion of sustainable development has been the focus of governments and academics since the *Brundtland Report* of 1987. It remains a contested idea, but is used as the basis of good decision-making that accounts for economic, social and ecological considerations in an integrated way (Asefa, 2005). The Brundtland Commission focused on three pillars of human wellbeing – economic, socio-political and ecological/environmental conditions as shown in Figure 5. The basic concept supported putting in place strong measures to stimulate economic and social development, particularly for people in developing countries, while at the same time ensuring environmental integrity would be sustained for future generations.

**Figure 4 The three-ring interpretation of sustainable development**



**Source:** Giddings, Hopwood, & O'Brien, (2002)

The practice of sustainable development is difficult to introduce in all parts of the world due to the difficulty of overcoming modernist silos of professional practice that impede the integration of knowledge and action. There is a high demand from multilateral organisations in developing countries to design and implement policies that reinforce sustainable development (Kassahun & Tiwari, 2012). Therefore, developing countries need to be thoughtful about the process of formulating policies for sustainable development and their implementation, especially for slums.

Two approaches to sustainability have been chosen to help with this task: one is the Extended Metabolism Model and the other is the Sustainable Development Goals (SDGs).

## **2.5 Urban metabolism and human settlements**

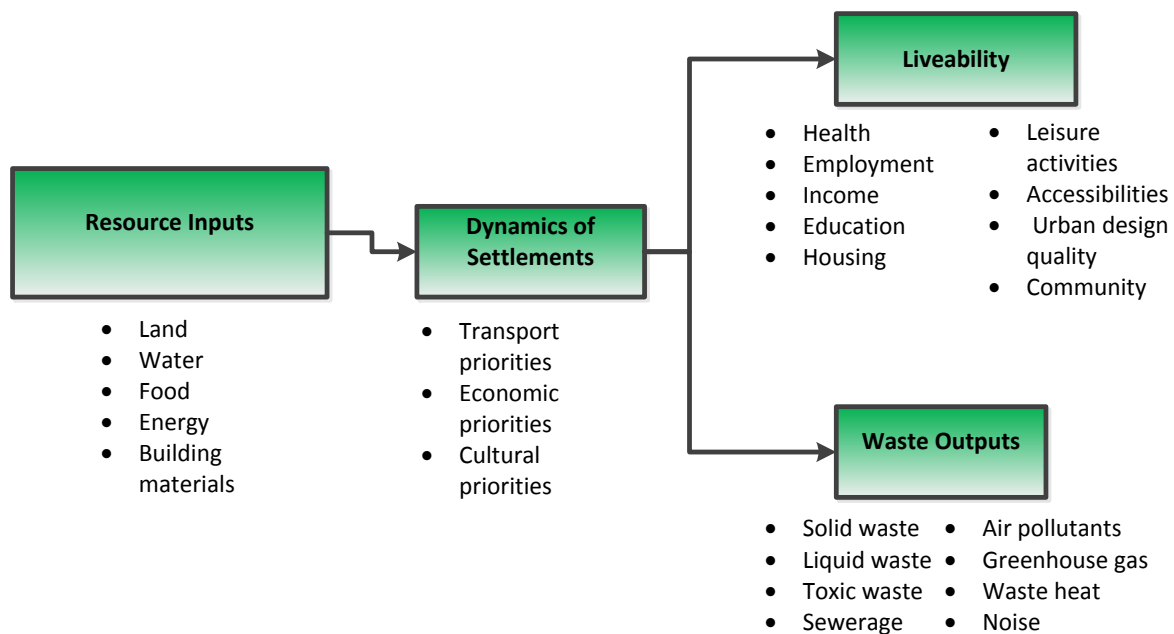
Abel Wolman (1965) used the concept of urban metabolism for the first time in his article entitled 'The metabolism of cities'. He defined the urban metabolic necessities of a city as 'all the commodities and materials needed to sustain the city's dweller at home, at work and at play' (Wolman, 1965). Recently the urban metabolism context has been used to report on environmental information in Australia, where researchers such as Newman have started to link urban metabolic measures to liveability, where liveability is about the human requirement for health and wellbeing, including individual, social amenity and community wellbeing. Liveability ensures that the economic and social dimensions of sustainability are incorporated, along with the ecological dimensions (Newman and Kenworthy, 1999).

The Extended Urban Metabolism Model was developed by Newman (1999) to illustrate how sustainability can be applied to cities. The model views cities as systems that require inputs of key resources. These are drawn into the urban processes and converted into waste through metabolism, as in all living systems, but also into anticipated liveability outputs. Newman argues that '... cities are more than a mechanism for processing resources and producing waste; they are about creating human opportunity'. Thus, to achieve sustainability, urban planners should not aim to just decrease the energy and material flows of a city, but also to enhance its

liveability, which is defined as an increase in health, employment, income, social services, community and the wellbeing of people.

The model explicitly covers all aspects of human life. For developing countries, especially in settlements, this means considerable efforts are made to increase the living standards of poor people, the majority of whom live in slum settlements. There is growing evidence that human settlements have large, untapped sustainability potential. Not only could cities potentially have no net impact, but they could even become regenerative, not only in terms of energy, but also for water, food and biodiversity. Each of these elements requires an understanding of urban stocks and flows, which can be provided through an urban metabolism analysis (Newman et al., 2017). However, in fact the thesis used sustainability to mean more than metabolism. The research uses the Extended Metabolism Model as an analytical framework, as it is the best (relevant) model to analyse the sustainability of cities in the global south. It uses metabolism and liveability parameters and these are measured for the first time on slums in the global south.

**Figure 5 Diagrammatic illustration of urban metabolism**



Source: Newman and Kenworthy (1999)



## **2.6 SDGs and slum upgrading**

The SDGs were established through a UN process and were designed to be applied at a national level, but have now begun to be applied to cities. Cities provide both enormous opportunities and profound challenges; therefore, how the process of urbanisation is managed is crucial, especially the management of the rapidly growing urban poor in slums. It is timely and critical to take into account how cities can execute an aspiring common agenda such as the SDGs, including Goal 11 on cities: 'Make cities inclusive, safe, resilient and sustainable' (UN-Habitat, 2015). Being agreed upon in 2015, with implementation now in progress, this ambitious agenda set 17 goals and 169 targets in areas of critical importance. Moreover, Habitat III – the major global summit on sustainable urban development that took place in Quito in October 2016 – also discussed how to execute SDGs in cities, given the opportunity to align these two major global processes.

The advantage of SDGs is that they represent a more holistic approach to urban solutions rather than isolated, sector-specific tasks. This way, SDG11 can be seen as an acknowledgement that urban problems are interrelated and must be resolved by integrated approaches. Access to essential infrastructure facilities, such as efficient waste management, clean potable water and energy for all, is fundamental to promoting better health and reducing sicknesses. Therefore, it is needed for economic development and equity. Appropriate sanitation and drainage services can minimise health risks, enhance environmental quality and prevent flooding and other related threats associated with climate change. In order to achieve such integrated goals, multi-scale planning, execution and implementation require that governments have adequate financial, human and institutional resources available (UN-Habitat, 2016). However, they also need to formulate the best way to think about how to approach solutions; sustainability can help to shape this thinking, especially if projects are evaluated in terms of sustainability frameworks such as SDGs.

## **2.7 From Millennium Development Goals to Sustainable Development Goals**

Although the slums have been part of the universal sustainable development agenda since the Millennium Summit, and even before that, their inclusion in the Millennium Development Goals (MDGs) was limited due to poor preparation and a lack of consistency under entirely environmental heading. Within this, Target 7D aimed to improve the lives of 100 million slum inhabitants. Although in some areas it has been achieved, slum improvement and reduction have been negatively offset by devastating slum development (Perry 2014; UN Habitat, 2013).

Although the lives of 220 million slum inhabitants have been improved, the total number of slum dwellers has increased, and it is estimated that 863 million people are currently living in slums. This figure is predicted to double by 2030; consequently urban poverty elimination remains a vast challenge to be addressed (UN-Habitat, 2016). This increasing disparity and exclusion is a result of the failure of housing policies and inadequate investment in pro-poor urban and housing development schemes. Learning from the MDG practice, it is paramount to continue determinations for better-quality living standards in slum towards sustainable and adequate housing for all through national targets indicators and monitoring mechanisms.

Sustainability, as defined by the SDGs, is only achieved through adopting integrated and comprehensive solutions that provide better results for a range of goals. Effective responses should be based on recognising the diverse forces behind different types of slum settlements and the requirement to adopt a range of policy tools (socioeconomic, physical and community) altogether. For such integration to be effective, it must be enclosed within long-term strategies to achieve wider societal goals based on the principles of sustainable development. Positive slum upgrading and renewal should therefore not be about merely providing housing and infrastructure, but also about prioritising economic, social and community activities that are needed to turn around downward trends in an area. Such an approach can indeed lead to urban regeneration at a precinct level and have an impact on the

overall urban fabrics of cities. When consistently undertaken in the context of slum improvement, the above measures can lead to the achievement of SDGs 6 and 11.

## **2.8 Concept of urban upgrading**

Urban upgrading is commonly defined as 'physical, social, economic, organisational, and environmental developments undertaken cooperatively by community groups, citizens, and local authorities to ensure sustained improvements in the quality of life for individuals' (UN-Habitat, 2003). Urban upgrading is focused on developing low-income settlements, and attracting investments to the city through financial and social programs that reinvest in the capacity improvement approaches needed by residents to secure a living environment and obtain an improved, healthy life – without being displaced. There have been a range of ways of doing this.

## **2.9 Slum upgrading approaches**

Until the 1970s the traditional approach of governments to solving the problem of slum settlements was through negligence and clearance; in their place modernist high-rise towers were built in the tradition of Le Corbusier and the CIEE movement (Ley, 2014; Trancik, 1986). In this way, governments seemed to destroy more low-income housing than they built, creating problems for the growing urban population (Werlin, 1999). It was not until later on in the 1970s that slums were recognised as urban realities that needed a reasonable solution. Governments of developing countries began to follow the trend of the developed world, which had begun to oppose the modernist approach. Authors such as Jane Jacobs (1966), espoused a more organic approach to urban renewal.

The first discussion of modern slum upgrading in the Third World can be found in the writings of John F. C. Turner. In his book, *Freedom to build* (1972), he argued that, based on field observations in Latin America, the response to slum challenges was not in their total clearance, but in enhancing the environment. If governments could improve the sanitary conditions and environmental quality of slum areas, then residents, given their resourcefulness and organisational skills would progressively improve their houses, especially when encouraged to do so by inducements of security of tenure and access to credit.

In 1972 the World Bank began to establish programs that were more organic, based on slum upgrading, self-help and sites and services schemes. Evaluation showed that in reality these organic programs were hampered by a deficiency of government programs as to how to improve slum settlements (World Bank, 2006). An opposite approach to the existing lack of political commitment and dispiritedness had been earlier identified as a main precondition to make slum upgrading programs successful (UN-Habitat, 2003).

The frequently criticised World Bank slum upgrading programs of the early 1970s taught some valuable lessons. Based on the precondition that slum housing provided an answer rather than creating a problem, developing country authorities gradually began to introduce slum improvement and sites-and-services schemes (Gilbert, 2007; Werlin, 1999). A number of studies showed that the necessity of secure land tenure, proper targeting and community participation was underestimated in these projects (Davis, 2007).

One typical response of the 1960s and 1970s, which failed, was that in order to prevent an increase in the number of poor, slum settlements needed to be eradicated and the poor relocated to resettlement sites, usually outside the city area (Cities Alliance, 1999). However, this was not feasible because the residents needed to be close to city centres where more informal income opportunities existed, along with public transport options, since the cost of transportation was often too expensive for them. As a result, moving the poor, or replacing their physical facilities with public housing, created more problems for the slum residents. The governments not only had to spend money cleaning up slums and resettling inhabitants, but also later they needed to finance public transportation from the outer areas to assist access to employment in the central city (Burra, 2005; Cities Alliance, 1999). The preferred method during this era of slum upgrading was total clearance of slums and their replacement with high-rise style public housing on the city's periphery. This mode of development disrupted existing social, economic and political ties of neighbourhoods. As research by Tolassa (2010) revealed, these economic and social ties are paramount for the survival of the urban poor.

During the 1980s, international organisations managed by the World Bank recommended that governments renounce any direct involvement in housing provision. They recommended that nations depend on market forces and facilitate housing supply through policies of privatisation, deregulation, decentralisation and demand-driven development (World Bank, 1993). Near the end of the century, however, the World Bank advised that governments could play an important role in institutional development (World Bank, 2000).

After 50 years of settlement upgrading experience, it is now acknowledged that a number of cities are developing based along the lines of an informal logic that is opposite to the way most planners are trained to think. This has led to shifts in policy guidelines since the 1970s, when favoured options were suppression, relocation and evictions based on land acquirement, land banking and traditional housing projects to a method of incorporation into housing policies in the 1980s, when land tenure legalisation, sites and services, and housing finance were granted; and the 1990s, when these approaches were combined with project planning in an attempt to provide infrastructure upgradings.

**Table 1 Summary of slum upgrading theories**

Phase	Decade	Focus	Instruments
Modernisation and urban growth	The 1960s–early 1970s	Physical planning and production of shelter by public agencies	Blueprint planning; direct construction (apartment blocks and core houses); eradication of informal settlements
Redistribution with growth/basic needs	Mid-1970s – mid-1980s	State support to self-help ownership on a project-by-project basis	Recognition of informal sector; squatter upgrading and site-and services; subsidies to land and housing
The enabling approach	Late 1980–early 1990	Securing an enabling framework for action by people, private sector and markets	Public-private partnership; community participation; land assembly and housing finance; capacity building
Sustainable urban development	Mid-1990s onwards	Holistic planning to balance efficiency, equity and sustainability	As above, with more emphasis on environmental management and poverty alleviation

Source: adapted from UN-Habitat, 2006

## 2.10 Urban renewal or in situ upgrading?

For the last six decades, governments in emerging nations, especially African countries, have implemented a number of approaches to solve the problem of slums. The argument over whether urban renewal or in situ upgrading is preferable is as old as the process of urbanisation. Those who support the idea of resettlement argue that the economic benefits of the displaced land are greater and that this alternative creates a win-win situation where the relocatees acquire alternate serviced land and get to live in better quality environments (Dupont 2008; Jha & Khosla 2005; Singh & Khosla, 2008). Those opposed to relocation believe that resettlement detaches residents from their livelihoods and exposes them to further poverty (Takesada, Manatunge and Herath, 2008; UN-Habitat 2011).

It has been a challenge to solve the problem because of inadequacy of data on the effects of relocation on the livelihoods, incomes and other socioeconomic and cultural issues of low-income inhabitants (Singh & Khosla, 2008). This is particularly the case in Ethiopian cities. While determining for resettlement, the planners and policy-makers place greater emphasis on calculating real costs earned by obtaining land and delivering basic urban service facilities subtracting estimated losses to the household and city economies caused by resettlement (AMES, 2015). Conversely, relocation of households to distant parts of a city can cause economic shock and social disruption to the poor (Burra 1999; Yntiso, 2008).

Informal settlements play a great role in contributing to a city's economy, particularly through their participation in the informal employment sector, which provides important support to the city's economic structure. Total contribution to employment in the formal sector in Addis Ababa is only 30 per cent, the balance coming from the unrecognised sector, which is said to account for 70 per cent of total employment in the city (CSA, 2016). Any disturbance in the informal sector has implications for the city and its operational functioning.

Generally, it can be said that the progression of policies relating to urban renewal has evolved from the old harsh approach of total clearance and eviction to one that is more sympathetic as well as more economically, socially and environmentally sustainable. As pointed out by Forster et al. in Gossaye (2000), more attention is paid to issues such as improvement of the community's wellbeing; preservation of invested capital, cultural heritage, traditions and the environment; as well as promotion of economic development, as an extension of the democratic process. However, upgrading of slums has not been linked to sustainability nor to new technologies for achieving smart, renewable settlements. This work is a major motivation behind the research reported here.

## **2.11 Re-blocking approach and community development**

There is a new approach to slum improvement: Re-blocking, which creates streets and public spaces throughout a slum. This is a process developed by Shack Dwellers International (SDI) that is based mainly on the spatial reconfiguration of shacks in slum settlements (SDI 2012). Re-blocking is considered an in-situ process due to its minimal disruption of resident's lives throughout the duration of the project. A study conducted by Cape Town Project Centre (2012) shows that Re-blocking has brought clear benefits with respect to fire safety, establishing roads, reducing greywater hazards, creating jobs and inspiring a sense of pride within the community in Mtshini Wam, South Africa.

## **2.12 New Urban Agenda**

In 2016 Habitat III, the UN Conference on Housing and Sustainable Urban Development, was held in Quito, Ecuador, and the New Urban Agenda (UN-Habitat, 2016) was adopted, setting up a sustainable urbanisation strategy and action plan for the next 20 years, anchored to the concept of cities for all, and promoting inclusivity based on the equal use and enjoyment of cities, towns and villages. It was designed to produce just, safe, healthy, accessible, resilient and sustainable cities and human settlements, understood to be a common good that substantially contributes to prosperity and quality of life for present and future generations.

This New Urban Agenda endorses our universal commitment to sustainable urban development as a critical step in achieving sustainable development in a comprehensive and organised manner at local, national and global levels, with the involvement of all relevant stakeholders. The application of the New Urban Agenda contributes to the execution and localisation of the 2030 Agenda for Sustainable Development in a combined manner, and to the achievement of SDGs and targets, together with SDG11 to make cities and human settlements inclusive, safe, resilient, and sustainable (UN Habitat, 2016).



The New Urban Agenda is another way of framing the objectives of this thesis, but in fact it did not contain any new approaches, so research for this thesis was conducted on the basis of the Extended Metabolism Model, the 1.5°C IPCC Agenda and the SDG's agenda.

### **Chapter 3 Research design and methods**

This section presents and explains the perspectives and methods used to answer the research question stated above. The selection of methodology for each publication is based on the study question it solves. Thus, different methods are used in each of the papers to address the particular research problems. The overview of the research methods used in these papers is provided below. Since the pragmatic methodology used to address each of the questions in this thesis is diverse and is explained in each of the papers following this introductory section, only a general overview of the methodology is presented here.

The research method for this study is based on a case study method approach using the city of Addis Ababa in Ethiopia. The case study method has been claimed as a useful instrument for gathering deeper comprehensions into multifaceted social occurrences, as it allows for a focus on characteristics such as social, economic, physical and community cohesion. A significant amount of literature has been collected about the subject area and the theories related to the subject to form an understanding of the context. Moreover, a number of urban upgrading and renewal case studies are investigated and eliminated in order to find the most appropriate ones that explain the urban improvement approaches.

The research was based on household survey data and interviews that aim at exploring the sustainability of current and improved slums in Addis Ababa. A mixed approach is used to gather appropriate data from various groups of respondents, including slum residents, community leaders, government officials and researchers. The primary data gathering was done in December 2014 and the second was done in 2016 in five selected, informal settlements in Addis Ababa. Household surveys were conducted with a total of 250 respondents from three slum settlements and two relocation sites. Primary data was collected from selected places using a combination of household questionnaires and participant observation methods to obtain qualitative and quantitative data. The simple stratified random sampling method was used in order to select the sample size for primary data collection.

### **3.1 Research location and description**

Three current slums and two high-rise condominium apartment sites were selected for the study.

Slums: Taliyan Sefer, Arat Kilo and Tora Bora

High-rise apartment sites: Ginfle and Yeka Ayat

Households from Arat Kilo had been resettled in Ginfle and in Yeka Ayat. Of the three slum settlements, Tora Bora was the most recent slum – at the time of data collection 10 years had passed since its establishment – while Taliyan Sefer and Arat Kilo slums were the oldest slum sites. A general description of each research sites is presented below.

#### **Arat Kilo (Arada)**

This slum settlement is a socially mixed residential place, where formal and informal structures coincide. Diverse typologies can be found ranging from single detached houses and cluster housing to poor dwellings. Additionally, the age, construction quality and infrastructural provisions of the buildings vary but overall are substandard.

#### **Taliyan Sefer (Addis Ketema)**

This slum settlement is part of the old inner centre and is dominated by a combination of deteriorating residential dwellings and commercial activities. It comprises the biggest market place of the country, Merkato, and the express bus port. Within Addis Ketema, Taliyan Sefer is one of the most densely populated areas with approximately 700 inhabitants per hectare.

#### **Tora Bora (Akaki Kality)**

This site is located on the periphery of Addis Ababa city and contains both types of informal and formal residential areas. Most of the land used by this informal slum was originally set aside for agricultural purposes.

### **Ginifle (Arada)**

This is a slum clearance high-rise apartment in Arada sub city, which is located in the inner city of Addis Ababa, a short walking distance from the Arat Kilo slum. Most of the people living here were former residents of Arat Kilo.

### **Yeka-Ayat (Yeka)**

The slum clearance Yeka-Ayat high-rise apartments are situated in the Yeka sub city administration located in the eastern part of Addis Ababa periphery. It is a new set of dwellings and most residents were slum dwellers from different parts of the city.

**Table 2 Selected sub-cities and settlements showing geographical locations**

<b>Sub City</b>	<b>Name of the Settlement</b>	<b>Geographical Location</b>
Addis Ketema	Taliyan Sefer	Inner-city old slums
Arada	Arat Kilo	
	Ginifle	Inner-city high-rise apartments (condominiums)
Akaki Kaliti	Tora Bora	Newly formed slums located on the outskirts of the city
Yeka	Yeka Ayat	High-rise apartments located on the outskirts of the city

### **3.2 Secondary data sources**

Various documents, including text books, reports, published and unpublished works and websites, were reviewed to obtain the necessary information on the research study. To respond to the challenge of data limitation, published and unpublished works and access of information from websites, acted as further reference materials.

### **3.3 Observation and photography**

Personal observations and photography by the researcher were adopted so as to gather variable information on characteristics of people's livelihoods and their day-to-day social interactions. The physical condition of the dwellings was observed and the information on their physical status recorded. Observation was another technique used to collect data. A checklist was prepared of issues to be observed. The researcher sought the following information:

- living conditions
- nature of the dwelling and material used
- infrastructure, e.g. water provision, sewerage, electricity, road network, solid waste
- movement and use of space
- economic situation
- social cohesion.

Photographs were taken of the subjects relating to the objectives of the study .

### 3.4 Summary of methodologies for each paper

The following section provides a summary of each publication submitted as part of this thesis; the full publications are provided later. Each publication answers a sub-question of this thesis and supported by the methodologies as outlined.

**Table 3 Publications and methodology used**

Questions	Paper	Methodology
To what extent have the slum redevelopments been successful in improving the socioeconomic and physical quality of human settlements?	Slum Regeneration and Sustainability: Applying the Extended Metabolism Model and the SDGs	The research method for this paper is based on a case study approach using the city of Addis Ababa in Ethiopia.  The research is based on interviews, and household survey data  This study used the Extended Metabolism Model indicators along with the seven targets from SDG 11 to evaluate the two slum development models
What are the main characteristics of slums in Addis Ababa?	Older slums in Addis Ababa, Ethiopia: how do they work?	The methodology for this paper was based on a two-stage random sampling technique. Firstly, a slum settlement in Taliyan Sefer within Addis Ketema sub city was selected, and in the second stage, households were selected.
How do we manage the	Applying a Sustainable	The paper was based on

<p>physical development needs along with economic and social development needs of these areas using a sustainable development framework?</p>	<p>Development Model to informal settlements in Addis Ababa.</p>	<p>household survey data and interviews.</p> <p>The paper applied the Extended Metabolism Model alongside the United Nations' Sustainable Development Goals (SDGs) as an analysis framework.</p>
<p>Is there a technological solution to a more community-based approach to slum regeneration?</p>	<p>Improvement of slums in Addis Ababa: Moving towards community-sensitive distributed infrastructure</p>	<p>Mixed research methods, such as questionnaire survey of slum households, interviews and participant observation method used in the study</p> <p>Empirical data were collected from three informal slum settlements and two slum clearance high-rise apartments</p> <p>The study adopted purposive sampling.</p> <p>The slums were selected based on two geographical locations (inner area and periphery)</p>
<p>Can the global agendas of 1.5°C carbon reduction work at the same time as enabling the SDGs in informal settlements?</p>	<p>Slum Upgrading: Can the 1.5 °C Carbon Reduction Work with SDGs in these Settlements?</p>	<p>The paper was based on interviews, and household survey data.</p> <p>The SDGs and the Paris Agreement are used as analytical frameworks to analyse the case studies data.</p>

### 3.5 Selection of case study

During the study period, site visits were frequently made to obtain first-hand data about the areas undergoing upgrading or renewal. During most of these visits, the researcher attended with local researchers and planners. A general literature review and site visits provided important background information on the renewal and upgrading process. After the general site visit, consultation was carried out with local planners and some researchers from Addis Ababa University, to identify suitable case study sites.

The respondents of the study were selected from five clusters of settlements located in three locations of slums and two relocation sites. They were selected from three clusters of slums in Addis Ketema, Arada and Akakiy Kaliti sub cities, which were mostly government owned houses and are very old city slums. Two other relocated sites have also been selected in Arada and Yeka sub cities, where the economic situation and the housing qualities are relatively better.

### **3.6 Extended Metabolism Model Indicators**

The analytical framework of this thesis is based on Newman and Kenworthy's (1999) Extended Metabolism Model. The Extended Metabolism Model was selected as the analytical framework because it enables the study of metabolism and liveability of slums together, whereas other metabolism models focused only on the inflow and outflow of resources. This model was previously applied by Alma Arief (1998) as a framework to integrate economic, social and environmental goals for slum dwellers living along the Ciliwung River in Jakarta, Indonesia. The application of the Extended Metabolism Model to a slum development in Jakarta is labelled and reflected on in the development of a sustainability model that enables analysis of these sites along with an integrated approach to policy-making.

This thesis will argue that the Extended Metabolism Model can also be applied to Addis Ababa and other similar sites in developing countries. Its application to the slums of Addis Ababa is outlined as a framework for collecting data necessary to effectively improve these settlements consistent with the SDGs. Thus, the data was collected based on the model's indicators, as shown in Table 4 below.

**Table 4 Indicators of Extended Urban Metabolism Model**

Human settlement domains	Indicators
Resource inputs	<ul style="list-style-type: none"> <li>• Land</li> <li>• Water</li> <li>• Energy</li> <li>• Food</li> <li>• Building materials</li> </ul>
Resource outputs	<ul style="list-style-type: none"> <li>• Solid waste</li> <li>• Liquid waste</li> <li>• Sewerage</li> <li>• Air pollutants</li> <li>• Greenhouse gas</li> <li>• Waste heat</li> <li>• Noise</li> </ul>
Liveability	<ul style="list-style-type: none"> <li>• Income</li> <li>• Employment</li> <li>• Education</li> <li>• Housing</li> <li>• Health</li> <li>• Leisure accessibilities</li> <li>• Urban design quality</li> <li>• Community</li> </ul>

Source: Newman & Kenworthy (1999)

### 3.7 SDG Indicators

Due to the interrelated nature of the SDGs, improving the slum dwellers' living conditions contributes to the achievement of many of the approved goals. This study used selected indicators from SDGs 1, 6, 7 and 11, as shown in Table 5, below.



**Table 5 Indicators of SDGs used in analysis**

Target	Indicators used
Target 1.2 Access to basic services	Proportion of population living in households with access to basic services
Target 6.1 Universal access to water	Access to improved water sources <ul style="list-style-type: none"> <li>• piped water into dwelling</li> <li>• public tap or standpipe</li> <li>• tubewell or borehole</li> <li>• protected dug well</li> <li>• protected spring</li> <li>• rainwater</li> <li>• bottled water</li> </ul> Access to piped water in premises
Target 6.2 Universal access to sanitation	Access to improved sanitation <ul style="list-style-type: none"> <li>• flush toilet to piped sewer system, septic tank or pit latrine</li> <li>• ventilated improved pit latrine</li> <li>• pit latrine with slab and</li> <li>• composting toilet</li> </ul>
Target 7.1 Universal access to affordable, reliable and modern energy services	Proportion of population with primary reliance on clean fuels and technology
Target 11.1 Access to housing for all	Number of urban population living in slums, informal settlements or inadequate housing

Source: Based on UN SDGs indicators (2016)

### **3.7 Analytical frameworks for the research**

The study used the global goals adopted by the United Nations as a reference for analysis.

#### **3.7.1 The Paris Agreement**

The Paris Agreement sets a long-term temperature goal of holding the global average temperature increase to well below 2°C and pursuing efforts to limit this to 1.5°C above pre-industrial levels (Tollin & Hamhaber, 2017). The Intergovernmental Panel on Climate Change is now seeking an agenda where 1.5°C is seen as the

primary focus which must be achieved while enabling the SDGs. This agenda would see an acceleration of renewable energy both replacing old fossil fuel systems and providing new power where there has previously been none; all the while this needs to happen while significantly improving the social and economic conditions of those consuming this power.

### **3.7.2 Sustainable Development Goals**

The Sustainable Development Goals (SDGs) as outlined above, build on the progress of the Millennium Development Goals (MDGs), which were approved by the heads of all nations in 2001 and expired in 2015. Whereas the MDGs were dedicated to decreasing the level of extreme poverty in all its forms, the SDGs focused on a comprehensive agenda that includes the environmental, economic and social dimensions of sustainable development, which is significant for all countries. The particular interest of this study is the aim of improving the sustainability of existing slum settlements. This is the eleventh objective among the 17 goals outlined in the SDGs. It revolves around the idea of making cities more habitable for humans. Essentially, this entails ensuring that living conditions in cities and urban centres are inclusive, safe, sustainable and resilient (George, 2015). However, it examined the SDG 1, 6 and 7 as well.

## **Chapter 4 Overview of publications**

The following section provides a summary of each publication submitted as part of this thesis; the full publications are provided later. Each publication answers a sub-question of this thesis as outlined.

### **4.1 Publication 1**

**Teferi, Z. A., & Newman, P. (2017).** Slum Regeneration and Sustainability: Applying the Extended Metabolism Model and the SDGs. *Sustainability*, 9(12), 2273.

#### **Paper abstract**

This paper examines the extent to which slum redevelopments have been successful in improving the sustainability of human settlements. Sustainability is measured in two ways: through the Extended Metabolism Model that looks at resource consumption, wastes, and liveability outcomes; and, through the framework of the Sustainable Development Goals (SDGs). The study compares the sustainability of informal slum settlements in Addis Ababa with high-rise slum clearance apartments; such clearance is the model mostly used for the world's informal settlements. The results show very little difference in resource consumption and waste produced but shows liveability outcomes are mixed: Economic benefit is substantially improved in the high-rise areas due to becoming part of the formal economy, but community networks and trust are substantially lost when people transfer from the slums. This paper suggests that slum policy could be shifted from the Modernist high-rise slum clearance approach to a more organic, community-based renewal of the slums themselves in which infrastructure for energy, water, and waste can be brought in. New technology that fits into community-based governance structures allows such infrastructure to be a viable option, as well as enabling formal economic benefits. Some hybrid approaches may be needed in many slum improvement programs.

#### **Method**

The method for this paper is based on a case study approach using the city of Addis Ababa in Ethiopia. This study applied the Extended Metabolism Model indicators, along with the seven targets from SDG 11 to evaluate the two slum development models.

## **4.2 Publication 2**

**Teferi, Z.A. & Newman, P. (2014).** Older slums in Addis Ababa: How do they work? *4th International Conference on Informal Urbanism Proceedings*, Cairo, Egypt.

### **Paper abstract**

Slum settlements in Addis Ababa have emerged in the built-up area of the old city of Addis Ababa (Addis Ketema) for over 50 years, and new slums are scattered throughout the rest of the city. The aim of this paper is to assess the operational qualities of households in older slum settlements of Addis Ababa, in terms of selected parameters. The survey of sample households reveals that the slum households have only modest access to the most basic services. Housing units are very overcrowded and in poor physical condition. It is suggested that such a settlement would be best improved by providing common municipal services required in day-to-day life. This paper demonstrates that there is nothing about the age of a settlement that ensures it will be upgraded; an intervention strategy will be required at some point in time.

### **Method**

The study was based on a two-stage random sampling technique. In the first stage Addis-Ketema slum was selected and then Taliyan Sefer neighbourhood was selected. Data was collected randomly from 100 sample households of Addis-Ketema slum through a field survey.

### **Conclusion**

The poor quality of the housing in low-level environmental surroundings, scarcity of potable water supply, poor sanitation, absence of street lights, use of low quality fuel, the absence of garbage disposal and poor drainage are common features of the slum households in Addis-Ketema (Taliyan Sefer). Despite the age of the settlement and its comparative advantage in having formalised rental tenure, the slum seems to be little better than other parts of Addis Ababa.

Lack of pro-poor government policy that can be targeted at the absence of basic services programs appears to be the major issue to be addressed in Addis-Ketema. The government has to prepare a special housing policy for poor settlements like Addis-Ketema that can provide the common municipal services required in day-to-day life. Households living in dilapidated houses are likely to be rehabilitated once basic services are provided.

The new approach of participatory budgeting may be the best way to finance and prioritise such basic services (Gollagher and Hartz-Karp, 2013; Licha, 2004). Involving the actual people who require the services will help to provide the best mechanism for determining where resources are needed first and how significant they could be. This approach also guarantees that corruption is minimised and that local labour be used where possible.

### **4.3 Publication 3**

**Teferi, ZA**, Newman, P., & Matan, A (2016) Applying a sustainable development model to informal settlements in Addis Ababa. In: Kerr, T. & Stephens, J. (eds), *Indian Ocean Futures: Communities, Sustainability and Security*. Cambridge Scholars Publishing, UK.

#### **Paper abstract**

Informal housing is a feature of the cities in developing countries around the Indian Ocean Rim. This chapter examines a model to see how informal housing performs in sustainability terms. It begins by applying it to Indonesia and then outlines a research project to apply the same model in Addis Ababa, Ethiopia. In Africa, informal housing is very extensive and in many cities like Addis Ababa it can be over 80 per cent. This project reports on how sustainability is being assessed in two informal housing projects. The model is based on Newman and Kenworthy's (1999) sustainable cities model, which looks at how reducing the ecological footprint (measuring energy, water and waste) is integrated with the need for improved liveability (including access to work and other opportunities, and social factors such as community strength). This chapter also introduces the new Sustainable Development Goals (SDGs) of the post-2015 agenda.

## **Method**

The data was analysed based on Newman and Kenworthy's (1999) sustainable cities model which looks at how the ecological footprint (measuring energy, water and waste) is balanced by liveability (including access to work and other opportunities, and community strength).

## **Conclusion**

Relocating people from slum areas is essential for providing better quality housing and a clean, healthy living environment where people are less prone to diseases resulting from poor sanitation. However, it has been found that a large number of the studied communities have been directly affected by the loss of traditional institutional and social networks. Due to a loss of social cohesion, the condominium residents are more vulnerable to personal and economic shocks than the slum inhabitants.

## **4.4 Publication 4**

**Teferi, ZA., & Newman, P.** Improvement of slums in Addis Ababa: Moving towards community-sensitive distributed infrastructure. *Urbanization*, IIHS. (forthcoming).

## **Paper abstract**

As a consequence of rapid urbanisation occurring in situations where there are economic and planning limitations, the majority of urban inhabitants in low-income countries live in slums which are characterised by a lack of essential services, such as water, energy and sewerage. This paper seeks to compare the adequacy of services and environmental characteristics of informal slum settlements in Addis Ababa with high-rise slum clearance apartments, using empirical data collected from three existing informal slum settlements and two slum clearance apartment sites to which slum dwellers had been relocated. The result reveals that the informal slum communities are exposed to physical, socioeconomic and health hazards because of poor quality housing, inadequate social services and poor environmental sanitation conditions. Despite the apartment dwellers having better housing quality and a clean, healthy living environment where they are less prone to poor sanitation and inadequate energy, they have lost important community structures in the new

buildings. This paper questions whether improving housing quality and infrastructure should necessarily also destroy important community structures. It suggests that new, small-scale distributed infrastructure might help in ameliorating the present service challenges both in slums and apartment sites, while maintaining the strength of informal community life.

## **Method**

Mixed research methods, such as a questionnaire survey of slum households, interviews and participant observations, were used in this study. The study adopted purposive sampling to approach the problem with a specific plan of selecting predefined groups of slum areas in the city. The slums were selected based on two geographical locations (inner area and periphery) and the age of the settlements (old and new).

## **Conclusion**

This study demonstrated that Addis Ababa, like many large emerging cities, is not dealing with its slums in a way that adequately demonstrates both physical and social benefits. There are ways in which high-rise slum clearance housing can better engage with its residents to enable the community quality to be maintained after they have moved.

## **4.5 Publication 5**

Teferi, Z. A., & Newman, P. (2018). Slum Upgrading: Can the 1.5° C Carbon Reduction Work with SDGs in these Settlements? *Urban Planning*, 3(2), 52-63.

## **Paper abstract**

The need to improve slum housing is a major urban planning agenda, especially in Africa and Asia. This article addresses whether it seems feasible to do this whilst helping achieve the 1.5 °C agenda, which requires zero carbon power along with enabling the Sustainable Development Goals. Survey data from Jakarta and Addis Ababa on the metabolism and liveability of slums are used to illustrate these issues. The article shows that this is possible due to advances in community-based

distributed infrastructure that enable community structures to be retained whilst improving physical conditions. The urban planning implications are investigated to enable these 'leapfrog' technologies and a more inclusive approach to slums that enables in situ redevelopment instead of slum clearance, and which could be assisted through climate financing.

### **Method**

The method for this paper is based on a case study approach using the city of Addis Ababa in Ethiopia. This study applied the Extended Metabolism Model indicators, along with the seven targets from SDG 11 to evaluate the two slum development models.

### **Conclusion**

The 1.5 °C agenda is largely an issue for the developed world and emerging places like China and India who need to adopt zero carbon economic development mechanisms. However, Africa and places like Indonesia will need to show they can be part of this new agenda. Slums are a dominant part of the agenda for urban development in the emerging world and like all new city development will require a different approach if it is to be part of the 1.5 °C agenda. This article shows that there is an urban planning approach using more organic upgrading and community-based infrastructure with Citizen Utilities that can enable slums to leapfrog into a future which is both zero carbon and can achieve the SDGs. Urban planners need to establish demonstrations of such Citizen Utility-based slum regeneration projects.



## Chapter 5 Conclusions and directions for future research

Slum settlements in Addis Ababa, like informal settlements in many emerging cities, face many challenges due to their economic status and environmental problems; however, they also have a major benefit – their social cohesion is very high. The city government is facing social pressure to make political decisions and to bring about solutions for their residents. Slum clearance and relocation is one option favoured by those who want to use the land for other purposes and to ‘clean up’ what is often seen as blight on the city. It is generally favoured by urban professionals used to providing centralised infrastructure. The option is to recognise the inherent value of the settlement and employ organic *in situ* slum upgrading. This is generally favoured by the people who are directly involved, the slum inhabitants.

This thesis has shown that there are now technologies available for infrastructure upgrading that can make it possible to maintain the community and unleash a process of upgrading that is self-sustaining rather than requiring massive government intervention, as witnessed in the slum clearance programs.

Most emerging cities have slum housing programs. However, the bulk of the upgrading activity focuses mainly on the housing itself and fitting it into centralised systems, which neglects the social and economic components of the existing settlements. Hence, *in situ* slum upgrading is an instrument that promises to promote empowerment, integrated urban development and social cohesion, as well as the environmental upgrading so eagerly desired. This is a more compelling approach to use in an environment of ever-increasing urban unemployment, poverty and widening socioeconomic inequalities, where there is also a lack of government funds for large-scale interventions.

The reality of slum settlement dwellers necessitates better quality of life options for their integration into the urban fabric as a step towards achieving the Sustainable Development Goals (SDGs). This thesis argues that there is a need for settlements to be upgraded on site, in preference to other options that are less favourable to people’s needs and which disrupt social and economic networks when people are relocated far away from their workplaces and burdened with added transportation

costs. By comparison, in-situ upgrading will create minimal disruption for the inhabitants of the settlement and will help grow economic opportunities out of the already existing networks created within and around the informal settlements.

In order to achieve sustainable slum improvement, planners and city policy-makers should recognise the value that currently exists in slum settlement patterns and seek to build on the social capital inside the urban fabric. The research confirms the need for a shift in slum-upgrading policy from slum clearance and transfer to high-rise developments into an *in situ* approach that maintains the strong community bonds that already exist. New, small-scale, community-based technology for infrastructure now makes this approach feasible though at times the structural faults in the buildings will be too great to allow improvements. Thus, sometimes a hybrid of the Modernist and Organic approach is likely to provide the best option. However, the key issue is to have an Organic approach as the core policy guiding all the interventions.

### **5.1 Direction for future research**

This thesis has suggested a way forward in creating more sustainable informal settlements through the comparative study of metabolism and liveability in existing slums and relocated high-rise apartments. The study has thrown light on some of the complex issues surrounding the topic. However, the recommendations are particularly basic, given the data that exists with regard to the built environment of three current slums and two relocated slums. Accordingly, a number of issues have been raised that need further investigation.

Firstly, there is a need to extend the data collection on metabolism, liveability and SDG indicators to a range of other slums in Addis Ababa and other emerging cities. Comparative studies will allow a more nuanced assessment to be made of the potential value of *in situ* slum improvements.

Secondly, a range of slums need to be fitted out with the new community-based technologies that can enable them to be properly tested. Simple micro grids of solar, water, waste and community management systems need to be evaluated and improved for mass mainstreaming. The ways in which local governments of these cities work with such community-based governance needs to be carefully evaluated for different cities.

Thirdly, overall economic studies need to be carried out to assess the benefits and costs of these approaches and how new global financing based on climate change and the SDGs could be used to provide opportunities for global partnerships in the upgrading and improvement of informal settlements in the emerging world.

## Exegesis bibliography

- Abdissa A. & Walelegn W. (2016). 'Sanitation practice of slum communities in Addis Ababa, Ethiopia.' *Science Journal of Public Health*. 4(4), 297–304.
- Abdulwasi, S. (2009). *An assessment of the effectiveness of the upgrading and revitalization strategies for housing development in case of Harar city* MSc Thesis, Ethiopian Civil Service University, Addis Ababa, Ethiopia.
- Alemayehu, E.Y. (2008). *Revisiting 'slums', revealing responses. Urban upgrading in tenant dominated inner-city settlements in Addis Ababa, Ethiopia.* (PhD) thesis. Norwegian University of Science and Technology, Trondheim.
- Aman M. (2016) *Development induced displacement in the context of UN guiding principles and AU convention: Experience from Addis Ababa City Urban Renewal Projects* (PhD thesis). Department of Political Science and International Relations. Addis Ababa University.
- AMES (2015). *Small towns Big returns: Economic and social impact of the Karen resettlement in Nhill.* A joint AMES and DELOITTE Access Economics Report. Retrieved from <https://www.ames.net.au/files/file/Research/19933%20AMES%20Nhill%20Report%20LR.pdf>
- Anríquez, G., & Stamoulis, K. (2007). *Rural development and poverty reduction: Is agriculture still the key?* ESA Working Paper no 07-02. Agriculture Development Economics Division. Retrieved from <http://www.fao.org/3/a-ah885e.pdf>
- Argaw, B. A. (2017). *Regional inequality of economic outcomes and opportunities in Ethiopia. A tale of two periods.* WIDER Working Paper 2017–18. United Nations University. Retrieved from <https://www.wider.unu.edu/sites/default/files/wp2017-118.pdf>
- Arief, A. (1998). *A sustainability assessment of squatter redevelopment in Jakarta* (Master's thesis). Murdoch University.
- Arimah, B.C., & Branch, C.M. (2011). *Slums as expressions of social exclusion: Explaining the prevalence of slums in African countries.* Paper presented at OECD International Conference on Social Cohesion and Development, Paris, (pp. 20–21).

- Asefa, S. (Eds). (2005). *The economics of sustainable development*. W.E. Upjohn Institute for Employment Research. Kalamazoo, Michigan.
- Asefa, S., & Huang, W. C. (Eds.). (2015). *The political economy of good governance*. WE Upjohn Institute.
- Asfaw, M., Zeluel, A., & Berhe, S. (2011). *Assessment of urban development practices on business expansion in Ethiopia*. Addis Ababa Chamber of Commerce and Sectoral Associations.
- Banerjee, A., Bhawalkar, J.S., Jadhav, S. L., Rathod, H., & Khedkar, D.T. (2012). 'Access to health services among slum dwellers in an industrial township and surrounding rural areas: a rapid epidemiological assessment.' *Journal of Family Medicine and Primary Care*, 1(1), 20.
- Beall, J., Crankshaw, O., & Parnell, S. (2014). *Uniting a divided city: Governance and social exclusion in Johannesburg*. Routledge.
- Bjerkli, C. (2013). 'Governance on the ground: A study of solid waste management in Addis Ababa, Ethiopia.' *International Journal of Urban and Regional Research*, 37(4), 1273–1287.
- Brown, D., & McGranahan, G. (2016). 'The urban informal economy, local inclusion and achieving a global green transformation.' *Habitat International*, 53, 97–105.
- Brundtland, G. H. (1987). *Report of the World Commission on Environment and Development (1987): Our common future*. World Commission for Environment and Development.
- Burra, S. (2005). 'Towards a pro-poor framework for slum upgrading in Mumbai, India.' *Environment and Urbanization*, 17(1), 67–88.
- Burra, S. (1999). 'Resettlement and rehabilitation of the urban poor: The story of Kanjur Marg', Working Paper No. 99, *Society for the Promotion of Area Resource Centres*, India. Retrieved from [rlarrdc.org.in/images/MUTP%20Project.pdf](http://rlarrdc.org.in/images/MUTP%20Project.pdf)
- Cadavid, P. R. (2011). *The impacts of slum policies on households' welfare: the case of Medellin (Colombia) and Mumbai (India)* (Doctoral dissertation, École Nationale Supérieure des Mines de Paris).

- Cape Town Project Center (2012). Supporting Reblocking and Community Development in Mtshini Wam.  
<http://wp.wpi.edu/capetown/homepage/projects/p2012/mtshini-wam>
- Central Statistical Agency of Ethiopia (CSA), (2016). *Ethiopia demographic and health survey 2016: Key Indicators Report*. Addis Ababa, Ethiopia.
- Central Statistical Agency of Ethiopia (CSA), (2012), *Analytical report on Urban Employment Unemployment Survey. Statistical Bulletin*. Addis Ababa, Ethiopia.
- Cervantes-Godoy, D. & J. Dewbre (2010), 'Economic importance of agriculture for poverty reduction'. *OECD Food, Agriculture and Fisheries Working Papers*, No. 23, OECD Publishing.
- Chattopadhyay, S., & Biswas, A. (2010). 'Slum improvement through legal framework in India.' *International Journal for Housing Science and its Applications*, 34(2).
- Chirisa, I., 2008. 'A population growth and rapid urbanization in Africa: Implications for sustainability.' *Journal of Sustainable Development in Africa*. 10(2) 361–394.
- Cities Alliance (1999). *Cities without slums: Action plan for moving slum upgrading to scale*. Washington DC: Cities Alliance.
- Cowden, J.R, (2008). *Planning and adaptation measures for urban slum communities in West Africa : stochastic rainfall modeling applied to domestic rainwater harvesting and climate change adaptation*. Dissertation, Michigan Technological University. Retrieved from <http://digitalcommons.mtu.edu/etds/724>
- Dafe, F. (2009). *No business like slum business? The political economy of the continued existence of slums: A case study of Nairobi*. Development Studies Institute, London School of Economics and Political Science.
- Davis, M. (2007) *Planet of slums*. London: Verso.
- Davis, M. (2006). 'Planet of slums.' *New Perspectives Quarterly*, 23(2), 6–11.
- Duguma, T.D., (2015). 'Assessment of determinants and modes of access to urban residential land and housing among different income households in Jimma City Administration, Oromia National Regional State, South West Ethiopia'. *International Journal of Science and Research*, 2319–7064.

- Dupont, V. (2008). 'Slum demolitions in Delhi since the nineties: In whose interest?' *Economic and Political Weekly*, 43(28), 79–87.
- Ejigu, A.G. (2012). 'The making of "modern" Addis: The role of the "Addis" myth.' In *Biennial Conference of the International Association for the Study of Traditional*
- Federal Democratic Republic of Ethiopia (FDRE), (2011) *Ethiopia's Growth and Transformation Plan (GTP) 2010/11–2014/15*. Ministry of Finance and Economic Development, Addis Ababa.
- Field, E. M., & Kremer, M. (2006). *Impact evaluation for slum upgrading interventions*. World Bank, Poverty Reduction and Economic Management, Thematic Group on Poverty Analysis, Monitoring and Impact Evaluation.
- Fox, S. (2014). 'The political economy of slums: Theory and evidence from Sub-Saharan Africa.' *World Development*, 54, 191–203.
- Frenzel, F. (2016). *Slumming it: the tourist valorization of urban poverty*. Zed Books Ltd.
- Gebre, G. G. (2012). 'Determinants of food insecurity among households in Addis Ababa city, Ethiopia.' *Interdisciplinary Description of Complex Systems*, 10(2), 159–173.
- George, S. (2015). 'Building sustainable cities: Tools for developing new building practices?' *Global Networks*, 15, 325-342.
- Giddings, B., Hopwood, B. & O'Brien, G. (2002) 'Environment, economy and society: fitting them together in sustainable development.' *Sustainable Development*, 10(4), 187–196.
- Gilbert, A. (2007). 'The return of the slum: Does language matter?' *International Journal of Urban and Regional Research*, 31(4), 697–713.
- Gittleman M. *Urban expansion in Addis Ababa: Effects of the decline of urban agriculture on livelihood and food security*. A paper presented at the United Nations 17th Commission on Sustainable Development. 2009.
- Glaeser, E. (2011). *Triumph of the city: How our greatest invention makes us richer, smarter, greener, healthier, and happier*. Penguin.

- Gollagher, M., & Hartz-Karp, J. (2013). The role of deliberative collaborative governance in achieving sustainable cities. *Sustainability*, 5(6), 2343–2366.
- Gossaye, A (2001). *Inner-city renewal in Addis Ababa. The impact of resettlement on the socio-economic and housing situation of low-income residents*. (PhD Thesis) NTNU, Trondheim: Department of Urban Design and Planning.
- Gossaye, A. (2000). 'Inner-city renewal and locational stability of the poor: a study of inner-city renewal program in Addis Ababa, Ethiopia.' *WIT Transactions on Ecology and the Environment*, 39.
- Forster, W., Gruber, H., Hansen, K.E., Tosics, I., Szolgayova, E. & Hauri, E., (1996). *Strategies to implement human settlements policies on urban renewal and housing modernization*, UN Publications, Geneva 11–16.
- Gulyani, S., & Bassett, E. M. (2007). 'Retrieving the baby from the bathwater: slum upgrading in Sub-Saharan Africa.' *Environment and Planning C: Government and Policy*, 25(4), 486–515.
- Hannum, H. (1995). The status of the Universal Declaration of Human Rights in national and international law. *Ga. J. Int'l & Comp. L.*, 25, 287
- Haregewoin, Y.M. (2007) *Integrated housing development programs for urban poverty alleviation and sustainable urbanization: the case of Addis Ababa*. In ENHR International Conference on Sustainable Urban Areas. Rotterdam.
- Hermanson, J.A. (2005). *Slums, informal settlements and inclusive growth in cities: Examples from Morocco and Colombia*. IHC Global Coalition for Inclusive Housing and Sustainable Cities, Washington, DC.
- Hove, M Ngwerume, E T & Muchemwa, S (2013). 'The urban crisis in Sub-Saharan Africa.' *Stability*, 2(1): 7, 1–14.
- Imparato, I., & Ruster, J. (2003). *Slum upgrading and participation: Lessons from Latin America*. World Bank Publications.
- International Model United Nations Association (IMUNA) (2015). Promoting sustained urban growth in Sub Saharan Africa; improving living conditions in slums In South East Asia.



- Jha, G. & Khosla, R. (2005). *Economics of resettling low-income settlements (slums) in urban areas: A case for on site upgrading. Final Report*. South Asia Network of Economic Research Institute, New Delhi.
- Jiboye A.D. (2011). 'Sustainable urbanization: Issues and challenges for effective urban governance in Nigeria.' *Journal of Sustainable Development*. 4(6), 211–224.
- Kassahun, S., & Tiwari, A. (2012). 'Urban development in Ethiopia: Challenges and policy responses.' *The IUP Journal of Governance and Public Policy* 7(1) 59–75.
- Kuma, T. (2004). 'Dry waste management in Addis Ababa city.' In *A paper presented on teaching workshop from January 5/16th in Addis Ababa*.
- Lemanski, C. (2011). 'Moving up the ladder or stuck on the bottom rung? Homeownership as a solution to poverty in urban South Africa.' *International Journal of Urban and Regional Research*, 35(1), 57–77.
- Ley, D. (2014). 'Modernism, postmodernism and the struggle for place'. In Agnew A.J. & Duncan J.S. (eds). *The power of place: Bringing together geographical and sociological imaginations*. Routledge: Oxon, UK, pp. 44–55.
- Licha, I. (2004) *Citizens in charge: managing local budgets in East Asia and Latin America*, Inter American Bank.
- Marx, B., Stoker, T., & Suri, T. (2013). 'The economics of slums in the developing world.' *The Journal of Economic Perspectives*, 27(4), 187-210.
- Martha Davis Urban Institute, (2006). *Deepening decentralization in Amhara Regional State and Tigray National Regional State and restructuring of nine urban local governments. Guidelines on Upgrading Kebele Housing and Neighborhoods*. The Urban Institute, Washington DC.
- Minx, J.C., Creutzig, F., Medinger, V., Ziegler, T., Owen, A. & Baiocchi, G., (2011). *Developing a pragmatic approach to assess urban metabolism in Europe: A report to the Environment Agency* prepared by Technische Universität Berlin and Stockholm Environment Institute, Climatecon Working Paper 01/2011, Technische Universität Berlin.

- Mitlin D., (2003). *The economic and social processes influencing the level and nature of chronic poverty in urban areas*. Chronic Poverty Research Centre Working Paper No 29.
- Montero, M G, (2016), *Analytic framework: resettlement vs upgrading the case of Colbot in Freetown, Sierra Leone*, Maters Thesis, University College London [http://www.slurc.org/uploads/1/6/9/1/16915440/dissertation\\_mgm\\_final\\_low\\_.pdf](http://www.slurc.org/uploads/1/6/9/1/16915440/dissertation_mgm_final_low_.pdf)
- Mukhija V (2001), 'Enabling slum redevelopment in Mumbai: Policy paradox in practice'. *Housing Studies*, 16:6, 791-806, DOI: 10.1080/02673030120090548, accessed on 4 April 2016 at <http://dx.doi.org/10.1080/02673030120090548>
- Muzzini, E. (2008) *Urban poverty in Ethiopia: A multi-faceted and spatial perspective*, Urban Papers, Washington DC.
- Newman, P. (2009). 'Planning and sustainable urban development: linking the green and brown agendas', in *UN Global Report on Human Settlements –2008*, UN-Habitat, Nairobi.
- Newman, P. (1999) 'Sustainability and cities: Extending the metabolism model.' *Landscape and Urban Planning*, 44, 219–226.
- Newman, P. and Kenworthy, J. (1999). *Sustainability and Cities*, Island Press, Washington DC.
- Newman, P, Beatley, T. & Boyer, H. (2017). *Resilient cities: Overcoming fossil fuel dependence*. Island Press, Washington DC.
- Ngau, P., Philip, O., Mbilo, J., Mutua, M., & Achieng, J. (2012). *Approaches to informal settlement upgrading in East Africa: The challenge of sustainable up-scaling of informal settlement upgrading*, Proceedings of a Regional Conference, University of Nairobi.
- Okpala, D. C. (1999). 'Upgrading slum and squatter settlements in developing countries: Is there a cost-effective alternative?' *Third World Planning Review*, 21(1), 1.
- Oliver, V.C. (2014). 'The management and delivery of urban infrastructure services.' *Ethiopia Urbanization Review Background Paper*, The World Bank.

- Participatory Upgrading of Informal Areas (PDP) in Egypt, (2010). *A decision-makers' guide for action*. Participatory Development Programme in Urban Areas in Egypt, Cairo.
- Patel, S., d'Cruz, C., & Burra, S. (2002). 'Beyond evictions in a global city: people-managed resettlement in Mumbai.' *Environment and Urbanization*, 14(1), 159–172.
- Perry, N., Greenhalgh, H., Cong, M. H., Liu, H., & Zhang, Y. (2014). *An Exploration of the Implementation and Sustainability of Urban Area Policies Aimed at Millennium Development Goals# 1 and# 7*. Report prepared for the Division for Public Administration and Development Management (DPADM), United Nations Department of Economic and Social Affairs (UNDESA); USC Sol Price School of Public Policy, University of Southern California: Los Angeles, CA
- Pugh, C. (1991). 'Housing policies and the role of the World Bank.' *Habitat International*, 15(1-2), 275-298.
- Regassa, B., & Regassa, N. (2015). 'Housing and poverty in Southern Ethiopia: Examining affordability of condominium houses in Hawassa City.' *Economics & Sociology*, 8(3), 155.
- Regassa, N., Sundaraa, R. D., & Seboka, B. B. (2011). Challenges and opportunities in municipal solid waste management: The case of Addis Ababa city, Central Ethiopia. *Journal of Human Ecology*, 33(3), 179–190.
- Research-inspired Policy and Practice Learning in Ethiopia (2009). *Improving WASH information for better service delivery in Ethiopia*, Addis Ababa.
- Restrepo Cadavid, P. (2011). *The impacts of slum policies on households' welfare: The case of Medellin (Colombia) and Mumbai (India)*. *Economies and finances*. Ecole Nationale Supérieure des Mines de Paris.
- Sachs, J. (2015) *The age of sustainable development*. Columbia University Press: New York.
- Sachs, J.D. (2012). 'From millennium development goals to sustainable development goals.' *The Lancet*, 379(9832), 2206–2211.
- Serneels, P. (2007). 'The nature of unemployment among young men in urban Ethiopia.' *Review of Development Economics*, 11(1), 170–186.

- Singh, P. & Khosla, R. (2008). *Resettlement of slum dwellers: A handbook for city governments*. Centre for Urban and Regional Planning, New Delhi.
- Sovacool, B.K., & Brown, M.A. (2010). 'Twelve metropolitan carbon footprints: A preliminary comparative global assessment.' *Energy Policy*, 38(9), 4856–4869.
- Stokes, C. J. (1962). 'A theory of slums.' *Land Economics*, 38(3), 187–197.
- Sullivan, W.C., Kuo, F.E., & Depooter, S.F. (2004). 'The fruit of urban nature: Vital neighborhood spaces.' *Environment and Behavior*, 36(5), 678–700.
- Takesada, N., Manatunge, J. & Herath I.L. (2008). 'Resettler choices and long-term consequences of involuntary resettlement caused by construction of Kotmale Dam in Sri Lanka. *Lakes and Reservoirs: Research & Management*, 13(3), 245–254.
- Tarekegn, E.A. (2000). *KITIYA – Transformation of Low Income Housing in Addis Ababa*. (PhD thesis) Trondheim: NTNU.
- Teferi, Z. A., & Newman, P. (2018). Slum Upgrading: Can the 1.5° C Carbon Reduction Work with SDGs in these Settlements? *Urban Planning*, 3(2), 52-63.
- Teferi, Z. A and Newman, P., (2017).  
Slum Regeneration and Sustainability: Applying the Extended Metabolism Model and the SDG's, *Sustainability*. 9(12), 2273.
- Teferi, Z.A., & Newman, P. (2017). 'Improvement of slums in Addis Ababa: Moving towards community-sensitive distributed infrastructure.' *Urbanization*, (forthcoming).
- Teferi, Z.A., Newman, P., & Matan, A (2016) 'Applying a sustainable development model to informal settlements in Addis Ababa.' In: Kerr, T. & Stephens, J. (eds), *Indian Ocean Futures: Communities, Sustainability and Security*. Cambridge Scholars Publishing, UK.
- Teferi, Z.A. & Newman, P. (2014). 'Older slums in Addis Ababa: How do they Work?' 4th International Conference on Informal Urbanism. Proceedings, Cairo, Egypt.
- Terefe, H (2005). *Contested space. Transformation of inner-city market areas, and users' reaction in Addis Ababa, Ethiopia*. (PhD thesis) NTNU, Trondheim.
- Tesfaye, A. (2007) 'Problems and prospects of housing development in Ethiopia'. *Property Management*, 25(1), 27–53.

- Tesfay, M. W. (2016). *The challenges of current urban upgrading projects in Addis Ababa, Ethiopia* (Master's thesis) NTNU, Trondheim.
- The World Bank, (2015). *Addis Ababa, Ethiopia: Enhancing urban resilience*  
Retrieved from  
<http://www.worldbank.org/en/topic/urbandevelopment/publication/addis-ababa-ethiopia-enhancing-urban-resilience>
- The World Bank, UNCHS (Habitat) (2013), *Cities Alliances for cities without slums: Action plan for moving slum upgrading to scale: UNDP-World Bank Water and Sanitation Program – South Asia*. New Delhi, India. Retrieved from <http://web.mit.edu/urbanupgrading/sponsor/ActionPlan.pdf>
- The World Bank (2012), *Action Plan for Moving Slum Upgrading to Scale: UNDP – World Bank Water and Sanitation Program – South Asia*, New Delhi, India. Retrieved from <http://web.mit.edu/urbanupgrading/sponsor/ActionPlan.pdf>
- The World Bank (2000), *Entering the 21st Century, World Development Report 1999–2000*, Oxford University Press, Washington DC.
- The World Bank (1993), *Housing enabling markets to work a World bank policy paper*, Washington, DC.
- Tollin, N., & Hamhaber, J. (2017). 'Sustainable and Resilient Cities: SDGs, New urban agenda and the Paris Agreement.' *Energia Ambiente e innovazione*, 1, 8.
- Tolon, U. W. (2008). *Comparison of urban upgrading projects on development cooperation in Ethiopia*. Universitat Politècnica de Catalunya, BarcelonaTech.
- Tolossa, D. (2010). 'Some realities of the urban poor and their food security situations: a case study of Berta Gibi and Gemechu Safar in the city of Addis Ababa, Ethiopia.' *Environment and Urbanization*, 22(1), 179–198.
- Trancik, R. (1986). *Finding lost space: Theories of urban design*. John Wiley & Sons.
- Turley, R., Saith, R., Bhan, N., Rehfuess, E., & Carter, B. (2013). *Slum upgrading strategies involving physical environment and infrastructure interventions and their effects on health and socio-economic outcomes*. Cochrane Data Base (1). Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/23440845>
- Turner, J. F., & Fichter, R. (eds). (1972). *Freedom to build: Dweller control of the housing process*. Macmillan.

- UN-Habitat (2016) *World Cities Report 2016: Urbanization and development—emerging features*, United Nations Human Settlements Programme
- UN-Habitat, (2015). *Urban infrastructure and basic services, including energy. Habitat III Issue Papers*, New York, N.Y.
- UN-Habitat (2014). *Streets as tools for urban transformation in slums: an approach to citywide slum upgrading.* UN-Habitat.
- UN-Habitat (2013). *State of the world's cities 2012/2013: Prosperity of cities.* Routledge.
- UN-Habitat (2011). *Cities and climate change: Global report on human settlements 2011.* London: Earthscan.
- UN-Habitat (2010). *The State of African Cities 2010: Governance, inequalities and urban land markets*, UN-Habitat, Nairobi.
- UN-Habitat (2007). *Slum upgrading: Framing the issues.* Prepared for CGAP. UN-Habitat.
- UN-Habitat, (2006). *Enabling shelter strategies: Review of experiences from two decades of Implementation.* UN-Habitat, Nairobi.
- UN–Habitat (2003a). *Guide to monitoring Target 11: Improving the lives of 100 million slum dwellers: Progress towards the Millennium Development Goals*, UN-Habitat, Nairobi.
- UN-Habitat (2003b). *The challenge of slums: Global report on human settlements 2003*, Earthscan, London.
- UNDESA, 2014. *World Urbanization Prospects.* United Nations Department of Economic and Social Affairs (UNDESA). Retrieved from <http://esa.un.org/unpd/wup/Highlights/WUP2014-Highlights.pdf>.
- UNICEF (2010). *Levels and trends in child mortality in Ethiopia.* UNICEF, New York, USA.
- United Nations Human Rights (2004). *Basic principles and guidelines on development-based evictions and displacement.* UN, Switzerland. Retrieved from <http://www.ohchr.org/SP/Issues/Housing/Pages/ForcedEvictions.aspx>

- Weinstein, L. (2008). 'Mumbai's development mafias: Globalization, organized crime and land development.' *International Journal of Urban and Regional Research*, 32(1), 22–39.
- Werlin, H. (1999). 'The slum upgrading myth.' *Urban Studies*, 36(9), 1523–1534.
- Wolman, A., (1965). 'The metabolism of cities', *Scientific America*, 213(3), 179–190.
- Wubneh, M. (1976). *Spatial dynamics and infrastructure investment: An analysis of the effects of infrastructure on the development of urban areas and locational decisions of firms in Ethiopia*. Retrieved from <https://search-proquest-com.dbgw.lis.curtin.edu.au/docview/302796528?accountid=10382>
- Wubneh, M. (2013). 'Addis Ababa, Ethiopia – Africa's diplomatic capital.' *Cities* 35: 255–269.
- Wubneh, M. (1983). *Spatial Analysis of Urban-Industrial Development in Ethiopia*, Syracuse, New York: Syracuse University
- Yntiso, G (2008). 'Urban development and displacement in Addis Ababa: The impact of resettlement projects on low-income households', *Eastern Africa Social Science Research Review*, 24(2) 53–77  
<http://www.rlarrdc.org.in/images/Resettlement%20Projects%20in%20Addiba.pdf>

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## **Publication 1**

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### To whom it may concern

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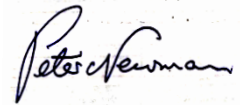
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I, as co-author, endorse that this level of contribution by candidate indicated above is appropriate

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Article

# Slum Regeneration and Sustainability: Applying the Extended Metabolism Model and the SDGs

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**Abstract:** This paper examines the extent to which slum redevelopments have been successful in improving the sustainability of human settlements. Sustainability is measured in two ways: through the Extended Metabolism Model that looks at resource consumption, wastes, and liveability outcomes; and, through the framework of the Sustainable Development Goals (SDGs). The study compares the sustainability of informal slum settlements in Addis Ababa with high-rise slum clearance apartments; such clearance is the model mostly used for the world's informal settlements. The results show very little difference in resource consumption and waste produced but show liveability outcomes are mixed: Economic benefit is substantially improved in the high-rise areas due to becoming part of the formal economy, but community networks and trust are substantially lost when people transfer from the slums. This paper suggests that slum policy could be shifted from the Modernist high-rise slum clearance approach to a more organic, community-based renewal of the slums themselves in which infrastructure for energy, water, and waste can be brought in. New technology that fits into community-based governance structures allows such infrastructure to be a viable option, as well as enabling formal economic benefits. Some hybrid approaches may be needed in many slum improvement programs.

**Keywords:** apartments; high-rise; metabolism; SDGs; slums; sustainability

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## 1. Introduction

Sustainability is a concept that needs to be applied to all human activity, especially cities. Its application requires various models and tools to enable cities to see how they can integrate economic, social, and environmental goals into their long term future. In this paper, we use two tools: the Extended Metabolism Model framework and the Sustainable Development Goals framework, which are outlined below before they are applied to slum regeneration in Addis Ababa, as a demonstration of how this critical issue can be given a sustainability perspective.

In 2003, there were an estimated 1 billion slum dwellers in the world; by 2020, this figure is projected to double to two billion people [1]. Urbanisation is a global phenomenon, sometimes leading to the dramatic growth of cities and urban districts which can stretch the ability of the city to provide sufficient adequate housing. In developing countries, informal urbanism emerges as a substitute for a formal city growth to address these massive rural-urban migration movements. Currently, an estimated 72% of urban dwellers in Sub-Saharan Africa are living in such informal slums [2]. With only an estimated 24% of the population living in urban areas, East Africa remains the least urbanized sub-region in Africa, so if that changes the amount of informal settlement in Africa may grow even faster [3].

As an example of this phenomenon, approximately 80% of Addis Ababa's three million inhabitants live in the city's slums ("Yedekeku Menderoch") or other types of informal settlements [4–6].

These settlements are characterised by substandard housing conditions and a lack of essential services, as developing cities like Addis Ababa do not have the necessary financial resources in their residents, cities, and national economies to provide better settlements [7].

There has been an evolution in policy responses to the challenge of slums over the past 40 years. Slum relocation and clearance were the conventional solutions based on a primarily negative outlook of slum settlements and a strong commitment to a modernist approach of building high-rise complexes to replace them. This approach was tried and rejected in most developed cities [8] but has now been adopted almost universally in developing country informal settlements. The obvious problem that has emerged is that the bulk of slum relocation high-rise has been pushed to the outskirts of cities, where many economic and social services are not easily available [9]. This paper will look at the evidence of sustainability outcomes in Ethiopia as a way of pursuing an alternative approach to slum improvement.

Like other cities in the developing world, many Ethiopian cities fail to accommodate growth within formal, planned urban framework dwelling policies and strategies. Thus only informal settlements result and without formal addresses and approvals to improve their condition there is no access to suitable financing to enable better housing or to enter the formal economy in terms of employment [6,10,11].

The Ethiopian government, in collaboration with its development partners, have thus begun to adopt policies and introduced a number of programs to solve the problems of present slums as well as prevent emerging new ones. However, it is not clear that they are actually improving the lives of those living in slum settlements, and thus this paper has been motivated to investigate what is happening in both old slums and new slum clearance housing, to try and seek some clarity on how to move forward.

Perhaps the biggest issue underlying the slum policies and programs is whether slum clearance is able to help on all levels of environmental/physical health, socio-economic health, or community health. Without both aspects being covered, the policies will be unbalanced and could do more harm than good [12]. Sustainability is obviously about how to integrate these factors in all developments [13].

The paper explores the extent to which the slum redevelopments have been successful in improving the socio-economic and physical quality of human settlements and improving the living conditions of the residents. Such issues require a sustainability framework to assess the outcomes.

## 2. Sustainability Frameworks

The main reason for the particular framing of the data collection was to see how sustainability relates to informal settlements using two theories. The first is to apply the Extended Metabolism Model of Newman [14], which has been posited as a way to examine the notion of sustainable development in cities [13]. This model is increasingly used for developed cities seeking to create a more circular metabolism [15] but has not been applied to emerging cities.

The other major framing is the Sustainable Development Goals, which have been set up and recognized by global consent but have not yet been researched to see how they are integrated and can provide perspective on how future cities can become more sustainable with their complex issues of economic development, environment, community, and equity [16,17].

### 2.1. Urban Metabolism and Slum Settlements subsection

Abel Wolman [18] used the concept of urban metabolism for the first time in his work entitled "The Metabolism of Cities". He defined the urban metabolic necessities of a city as "all the commodities and materials needed to sustain the city dweller at home, at work and at play" [18]. See Figure 1.



Figure 1. Energy and material flows in urban areas. Source: [19].

More recently, the metabolism context has been used in the reporting of environmental information in Australia, where researchers have started to link urban metabolic measures to liveability, where liveability is about the human requirement for health and well-being, including both individual, social amenity, and community wellbeing. Liveability ensures that the economic and social dimensions of sustainability are incorporated with the ecological dimensions [20].

The Extended Urban Metabolism Model was developed by Newman [14] to illustrate how sustainability can be applied to cities. See Figure 2.

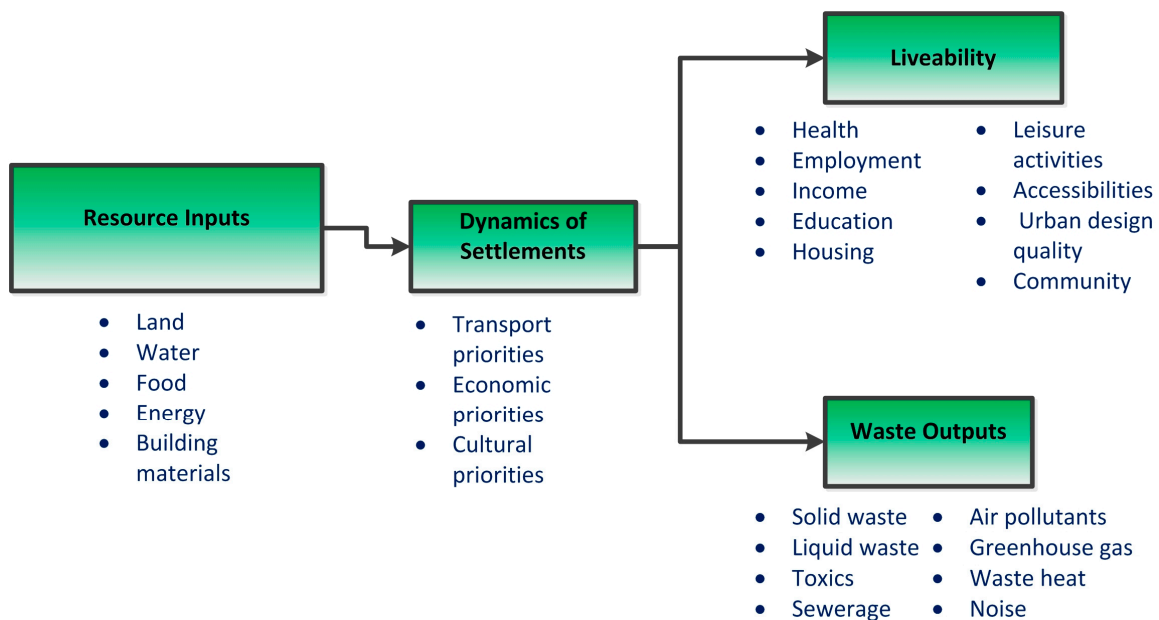


Figure 2. The extended metabolism model. Source: [14].

The model views cities as systems that require inputs of key resources that are drawn into the urban processes, which then convert them into waste through metabolism, as in all living systems, but also into anticipated liveability outputs. Newman argues that “... cities are more than a mechanism for processing resources and producing waste; they are about creating human opportunity” [14]. Therefore, to achieve sustainability, urban planners should not only aim to reduce

material and energy flows (inputs and waste outputs) but also to increase the liveability of the city, which is understood as an increase in social amenity, health, and well-being of citizens. This covers the whole gamut of socio-economic outcomes being sought in cities.

The model explicitly, therefore, attempts to show how all aspects of human life in cities need to be considered when assessing the outcomes of development in cities. For developing countries, especially in settlements, this means more considerable efforts to increase the living standards of poor people, the majority of whom live in slum settlements.

The Extended Metabolism Model can also be used to assess future directions in cities [21] and show how they may even become regenerative, not only in terms of energy but also for water, food, and biodiversity [21–23]. Each of these elements needs an understanding of urban stocks and flows, which can be provided through an urban metabolism analysis [15].

The paper will attempt to shed light on the sustainability of informal settlements by using the Extended Metabolism Model.

## 2.2. Sustainable Development Goals and Slum Settlements

The Sustainable Development Goals were established through a UN process for application at a national level but have now begun being applied to cities. Cities offer both great opportunities and profound challenges; thus, how urbanisation processes are managed is critical, especially how they manage the rapidly growing urban poor in their slums. It is timely and crucial to consider how cities can execute an ambitious universal agenda like the Sustainable Development Goals (SDGs), including Goal 11 on cities: “make cities inclusive, safe, resilient and sustainable” [3].

Agreed in 2015, with implementation now in progress, the SDGs are an ambitious agenda, setting 17 goals and 169 targets in areas of critical importance: people, planet, prosperity, peace, and partnership. Furthermore, Habitat III—the major global summit on sustainable urban development that took place in Quito in October 2016—also discussed how to implement the SDGs in urban areas, providing an opportunity to align these two major global processes.

The advantage of SDGs is that they represent a more holistic approach to urban solutions rather than isolated, sector-specific tasks. In this way, SDG11 can be seen as an acknowledgement that the urban problems are interrelated and must be resolved by integrated approaches. Access to essential infrastructure facilities such as efficient waste management, access to clean potable water, and energy access for all is fundamental for promoting better health and reducing sicknesses. Thus, it is needed for economic development and equity. Appropriate sanitation and drainage services can minimise health risks, enhance environmental quality, and prevent flooding and other related threats associated with climate change. In order to achieve such integrated goals, multi-scale planning, execution, and implementation require that governments have adequate, financial, human, and institutional resources available [1]. However, they also need the right way to think about how to approach solutions and sustainability can help with shaping this thinking, especially if projects are evaluated in terms of sustainability frameworks like the SDGs.

## 2.3. From Millennium Development Goals to Sustainable Development Goals

Though the slums had been part of the global sustainable development agenda since the Millennium Summit (and indeed before), their incorporation in the MDGs was limited by poor formulation and their lack of coherence under an exclusively environmental rubric. Target 7D aimed at improving the lives of 100 million slum dwellers. Though in some cases it has been achieved, progress on slum improvement and reduction has been negatively offset by overwhelming slum growth [24].

While the lives of 220 million slum dwellers have been improved, the total number of slum dwellers has increased, and it is estimated that 863 million people are now living in slums. The number is projected to double by 2030, and thus urban poverty eradication stays an enormous challenge to be addressed [25]. This increased inequality and exclusion is a consequence of the failure of public and private investment in pro-poor urban and housing development.

Learning from the MDG experience, it is important to continue efforts for improved living standards in slums towards sustainable, inclusive, and adequate housing for all. The target will be owned by national and local authorities developing rights-based, gender responsive, and results-based national housing and slum upgrading strategies and programs formulated with full participation. In particular, cities must strengthen the capacities of women, youth, and vulnerable groups so that they may function as agents in the improvement of living standards and the realization of the right to adequate housing without unlawful forced evictions.

Sustainability, as suggested by the SDGs, is only achieved through adopting comprehensive, integrated solutions that provide better outcomes for a range of goals. Successful responses should be based on acknowledging varied forces behind different types of slum settlements and the need to apply a range of policy tools (social, economic, physical, and community) altogether. For such combined integration to be effective, they must be enclosed by long-term strategies to achieve wider societal goals based on the principles of sustainability. A positive slum upgrading and renewal should therefore not be about merely providing housing and infrastructure but rather about prioritizing economic, social, and community activities that are needed to turn around downward trends in an area. Such an approach can indeed lead to urban regeneration at a precinct level and impact the overall urban fabrics of cities.

The most significant thing about the SDGs is that they take these integrative approaches and apply them to all areas of development need, including cities. Thus, the SDG 11 to “make cities inclusive, safe, resilient and sustainable” has a series of targets that need to be assessed in an integrative way in order to evaluate the success of any urban development policy. Thus, these targets for SDG 11 will be used to assess the policy of slum clearance in emerging cities such as Addis Ababa.

### 3. Policies for Slum Improvement

#### 3.1. History

Until the 1970s, the traditional method of governments to deal with slums was neglect and clearance in order to build modernist high-rise towers following the tradition established by Le Corbusier and the CIEE movement [26,27]. By doing this, governments seemed to destroy more low-income housing than they built, which, with a growing urban population, was very difficult [28]. Later, in the 1970s, however, slums were recognised as urban realities that require an adequate solution. This recognition began to follow the trends of the developed world, which had begun to oppose the modernist tradition through authors such as Jane Jacobs [8], who helped to begin a more organic approach to urban renewal.

The first reference point of modern slum upgrading in the third world appears to be John F. C. Turner’s writings. In his book, *Freedom to Build* [29], he argued, based on field observations in Latin America, that the response to slum challenges was not in their total clearance, but in enhancing the environment; if governments could improve the sanitary conditions and environmental quality of slum areas, then residents, given their resourcefulness and organizational skills, would progressively improve their houses, especially when encouraged by security of tenure and access to credit.

From 50 years of upgrading settlements, it is now known that most cities are growing based on an informal logic following a pattern reverse to what most planners are trained to. This has led to shifts in policy doctrine since the 1970s from emphasizing repression, resettlement, eradication, and evictions based on land acquisition, land banking, and conventional housing projects to an approach of integration into housing policies in the 1980s providing for land tenure regularization, sites and service, and housing finance, and, in the 1990s, to combined approaches along with programme designs endeavouring to deliver infrastructure improvements. See Table 1.

**Table 1.** Summary of slum upgrading theories.

Phase	Decade	Focus	Instruments
Modernization and urban growth	The 1960s–early 1970s	Physical planning and production of shelter by public agencies	Blueprint planning; direct construction (apartment blocks and core houses); eradication of informal settlements
Redistribution with growth/basic needs	The mid 1970s–mid 1980s	State support to self-help ownership on a project-by project basis	Recognition of informal sector; squatter upgrading and site-and services; subsidies to land and housing
The enabling approach	Late 1980–early 1990	Securing an enabling framework for action by people, private sector, and markets	Public-private partnership; community participation; land assembly and housing finance; capacity building
Sustainable urban Development	Mid 1990s onwards	Holistic planning to balance efficiency, equity, and sustainability	As above with more emphasis on environmental management and poverty alleviation

Source: Adapted from [30].

### 3.2. Urban Renewal or In Situ Upgrading?

For the last six decades, governments in emerging nations, especially African countries, have implemented a number of approaches to solving the problem of slums. The argument is over whether urban renewal or on-site upgrading is as old as the process of urbanisation, particularly the urbanisation of poverty and slum growth. Those in favour of clearance and resettlement believe that the economic value of the evacuated land is higher and that this option creates a win-win situation in which the poor get alternate serviced land and get to live in good quality environments [31–33]. Those against clearance and resettlement believe that resettlement distances people from their livelihoods and shocks them into poverty [34,35].

Generally, it can be said that the progression of policies regarding urban renewal has been evolving from total clearance and eviction approaches to a softer, more economically, socially, and environmentally sustainable approach. As pointed out by Forster [36], more focus is given to issues like improvement of the well-being of the community, preservation of invested capital, promotion of economic development, preservation of cultural heritage and traditions, preservation of the environment, as well as an extension of democratic process [36]. However, they have not related the upgrading of slums to sustainability or to new technologies for achieving smart, renewable settlements. This work is a major motivation behind the research reported here.

The paper endeavours to explore the sustainability of slum settlements by taking a critical look at alternative approaches to solving the problem through two sustainability frameworks. One such approach, which we have called the Modernist approach, was traditionally used to clean up old areas using standard high-rise building, not just because of the need to provide better housing and economic outcomes but also because modernist high-rise buildings were seen to be a preferred way of building cities. The other approach, which we have called the Organic approach, is a more in situ approach that respects the informal settlement for what it is and suggests it would be better to shift to a more community-based renewal of the slums themselves in which infrastructure for energy, water, and waste can be brought in, economic opportunities created, and the social structure of the community maintained.

It has been challenging to resolve the controversy between such approaches because of a lack of data on their impact on changes in incomes, livelihoods, and other socioeconomic and cultural conditions of low-income households [31]. This is particularly the case in Ethiopian cities. While deciding on the Modernist approach of clearance and relocation, the planners and policy makers in Ethiopia lay greater emphasis on estimating real costs incurred in land procurement and provision of basic urban services without estimating losses accruing to the household and city economy in the process of resettlement [36–38]. On the other hand, resettlement through relocation of households to faraway places in the city can trigger economic shocks and social disruptions of the inhabitants [39,40]. This paper attempts to help by providing data on the differences in these outcomes comparing informal slums with high-rise relocation projects.



#### 4. Research Design and Methods

The research method for this paper is based on a case study approach using the city of Addis Ababa in Ethiopia. A case study approach has been argued as being a valuable tool for gaining deeper insight into complex social phenomena, as it allows the opportunity to focus on attributes such as social, economic, physical, and community cohesion. This is what the paper seeks to do, to provide an integrated sustainability assessment of slum settlement approaches.

The research is based on interviews, and household survey data that aims at exploring the sustainability of current and improved slums in Addis Ababa. A mixed method is used to collect data, as it is considered suitable for gathering information from different groups of participants including households in slums, government officials, researchers, and community leaders. The primary data gathering was done in December 2014 and secondly in 2016 in five selected informal settlements in Addis Ababa. Household surveys were conducted with 250 respondents from the slums in total. Primary data was collected from the selected sites by using a combination of household questionnaires, participant observation methods, and household mapping to obtain qualitative and quantitative information. A stratified random sampling method was adopted to select the sample size for primary data collection.

##### 4.1. Research Location and Description

Addis Ababa is the only large African city with no colonial legacy. It was established upon the fabric of an indigenous settlement. The indigenous urban structure hosts an urbanity featured by a ‘mixity’—as it is commonly called in Addis Ababa—of economies, social strata, and functions [41].

Addis Ababa is the capital city of Ethiopia and home to an estimated 3 million inhabitants, or about 30 per cent of the Ethiopian population [38]. It is one of the world’s fastest-growing cities (4 per cent per year), due to both rural exodus (40 per cent of the annual population increase) and fast-paced demographics [1]. Due to its location in the centre of the country, as well as the relative neglect of other urban areas, the city accounts for most of the social and economic infrastructure of Ethiopia [1]. Yet, Addis Ababa faces great challenges in terms of development, notably in the areas of housing, infrastructure, and employment [42]. Also, inadequate governance prevents the municipality from addressing these issues in an efficient manner.

Three current slums and two high-rise condominium apartment sites were selected for the study:

- Slums: Taliyan Sefer, Arat Kilo, and Tora Bora;
- High-rise apartment sites: Ginfle and Yeka Ayat;
- Households from Arat Kilo had been resettled in Ginfle and in Ayat.

Of the three slum settlements, Tora Bora was the most recent slum; 10 years had passed at the time of data collection, while Taliyan Sefer and Arat Kilo slums were the oldest slum sites. The general description of the research sites are presented below (see also Table 2).

**Table 2.** Selected sub-cities and settlements showing geographical locations.

Sub City	Name of the Settlement	Geographical Location
Addis Ketema	Taliyan Sefer	Inner city old slums
	Arat Kilo	
Arada	Ginfle	Inner city high-rise apartments (condominiums)
Akaki Kaliti	Tora Bora	Newly formed slums located at the outskirts of the city
Yeka	Yeka Ayat	High-rise apartments located at the outskirts of the city

Source: Authors own data.

#### 4.1.1. Arat Kilo (Arada)

This slum settlement is a socially mixed residential place, where formal and informal structures coincide. Diverse typologies, ranging from single detached house and cluster housing to poor dwellings, can be found. Additionally, the age, construction quality, and infrastructural provisions of the buildings vary but are substandard overall.

#### 4.1.2. Taliyan Sefer (Addis Ketema)

This slum settlement is part of the old inner centre and is dominated by a combination of deteriorating residential dwellings and commercial activities. It comprises the biggest market place of the country, Merkato, and the express bus port. Within Addis Ketema, Taliyan Sefer is one of the most densely populated areas, with approximately 700 inhabitants per hectare.

#### 4.1.3. Tora Bora (Akaki Kality)

This site is located on the periphery of Addis Ababa city and contains both types of informal and formal residential areas. Most of the land used by this informal slum was originally set aside for agricultural purposes.

#### 4.1.4. Ginfle (Arada)

This is a slum clearance high-rise apartment in Arada sub city, which is located in the inner city of Addis Ababa, just located a short walking distance from the Arat Kilo slum. Most of the people living here were former residents of Arat Kilo.

#### 4.1.5. Yeka-Ayat (Yeka)

The slum clearance Yeka-Ayat high-rise apartments are situated in the Yeka Sub-city administration, located in the Eastern part of Addis Ababa periphery. It is a new set of dwellings and most residents are slum dwellers that came from different parts of the city.

### 4.2. Extended Metabolism Model Indicators

The Extended Metabolism Model was selected as an analytical framework because it enables us to study the metabolism and liveability of slums combined, while the other metabolism models focused only on inflows and outflows of resources. This model has been applied previously by Alma Arief [43] as a framework to integrate economic, social, and environmental goals in slum dwellers living along the Ciliwung River in Jakarta, Indonesia [15]. Its application to the slums of Addis Ababa was based on the model's indicators set out in Table 3. Only the indicators provided were possible to be measured in the slums of Addis Ababa.

**Table 3.** Indicators of extended urban-metabolism model.

Human Settlement Domains	Indicators
Resource inputs	Land
	Water
	Food
	Energy
	Building materials
Resource outputs	Solid waste
	Liquid waste
	Sewerage
	Air pollutants
	Greenhouse gas Waste

Table 3. Cont.

Human Settlement Domains	Indicators
Liveability	Health
	Employment
	Income
	Education
	Housing
	Leisure accessibilities
	Urban design quality

Source: [13].

#### 4.3. SDG Indicators

A general literature review and site visits provided important background information on the renewal and upgrading process. Site visits were frequently made to obtain first-hand data about the areas undergoing upgrading or renewal. After the general site visit, consultation was carried out with local planners and some researchers from local universities to identify suitable case study neighborhoods.

Due to the interrelated nature of the SDGs, improving the slum dwellers' living conditions contributes to the achievement of many of the approved goals. This study used the seven targets from SDG 11 to evaluate the two slum development models: organic slum development model based on community approaches and the Modernist slum clearance high-rise development model. The targets are listed below in Table 4 and these were evaluated based on the data collected from the extended metabolism assessment of the two types of slums in Addis Ababa.

**Table 4.** Indicators used in analysis of goal 11. "Make cities and human settlements inclusive, safe, resilient, and sustainable".

Target
11.1 By 2030, ensure access for all to adequate, safe, and affordable housing and basic services and upgrade slums.
11.2 By 2030, provide access to safe, affordable, accessible, and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities, and the elderly.
11.3 By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated, and sustainable human settlement planning and management in all countries.
11.4 Strengthen efforts to protect and safeguard the world's cultural and natural heritage.
11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations.
11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.
11.7 By 2030, provide universal access to safe, inclusive, and accessible green and public spaces, in particular for women and children, older persons, and persons with disabilities.

Source: Authors own data based on SDG indicators.

## 5. Results

### 5.1. Extended Metabolism Model

Table 5 sets out the results from the Extended Metabolism data collection the Addia Ababa slums compared to the slum clearance high rise housing estate.

**Table 5.** Metabolism and liveability of slum settlements and high-rise apartments.

Metrics	Slum Settlements	High-Rise Settlements
	Resource inputs	
1. Water (L/household/day)	261	186
2. Energy MJ/Household/day		
Electricity	3.10	2.60
Kerosene	58.00	54.00
Charcoal	2.10	0.12
Gasoline	4.01	7.03
Diesel	3.37	2.45
Total	70.58	66.02
	Waste outputs	
1. Solid waste	3.1 kg/household/day	2.6 kg/household/day
2. Liquid waste	341 L/household/day	260 L/household/day
3. Air waste (CO <sub>2</sub> )		
Electricity	726	402
Kerosene	4321	3902
Charcoal	123	12
Gasoline	210	490
Diesel	213	180
Total	5593	4986
	Liveability	
	30% employed in private business, government, and NGOs	45% employed in private business, government, and NGOs
1. Economic	30% self-employed (informal activities)	43% self-employed (informal activities)
	29% unemployed	7% unemployed
	3% pensioners	5% pensioners
	Average income Br10,560	Average income Br17,600
	Constructed from wood and mud	Constructed from concrete blocks
	Cooking and sleeping take place in same room	Separate bed and kitchen rooms available
2. Housing	70% government owned	100% privately owned
	No bathrooms; pit latrines and communal electric meters	Privately owned bathrooms and electric meters
	43% wish to live there with minor improvement	50% wish to live there
	30% need everything unchanged	
3. Education	67% primary school and below	30% primary school and below
	High level of community	Low level of community
	80% happy to live there	50% happy to live there
4. Community	95% feel secure	7% feel secure
	93% enjoy access to at least one informal borrowing or lending network	42% enjoy access to at least one informal borrowing or lending network
	97% trust neighbours	34% trust neighbours
		60% have social tie to previous communities

Source: Authors own data from 2016 field survey.

### 5.1.1. Metabolism

The slightly surprising results for resource consumption and waste production show very little difference between the informal slums and the high-rise projects. See Table 5. Energy, water, and waste are very informal in the first case but residents still find ways to consume, either legally or illegally. However, the consumption is very small by any comparison with other urban residents in cities across the world [13]. The management of the waste in the informal settlements is generally very dependent on local communities. In terms of the climate change agenda, the greenhouse gas emissions from both settlements are not very different, though the high-rise residents do increase their transport emissions, probably because of the new location being less central. Below, we discuss how a different approach is possible, explaining how the metabolism can be managed better within an Organic approach and using the SDGs as the framework.

### 5.1.2. Livability

The economic outcomes from the new high-rise development are significantly better than the informal slums, probably because the residents are given a formal address and hence can access the formal economy both in terms of banking, education, and employment. See Table 5 and Figure 3. It is critical that this element is maintained in any slum management policy, as it is a major step in providing people to end extreme poverty and also in furthering the development of the whole city.

Slums play an important role in building the city economy, in particular through the hard work of new migrants and their work in the informal sector, which is a vibrant support to the city’s economic system. The total contribution to employment by the organized sector in Addis Ababa was only 30%, with the balance coming from the unorganized sector, which is said to account for 70% of total employment [44]. Thus, any disruption in the informal sector has implications for the city and its functioning. By providing a formal address and an upgrading process in either the Organic in situ approach or the Modernist high-rise approach, the economic outcomes are likely to be similar.

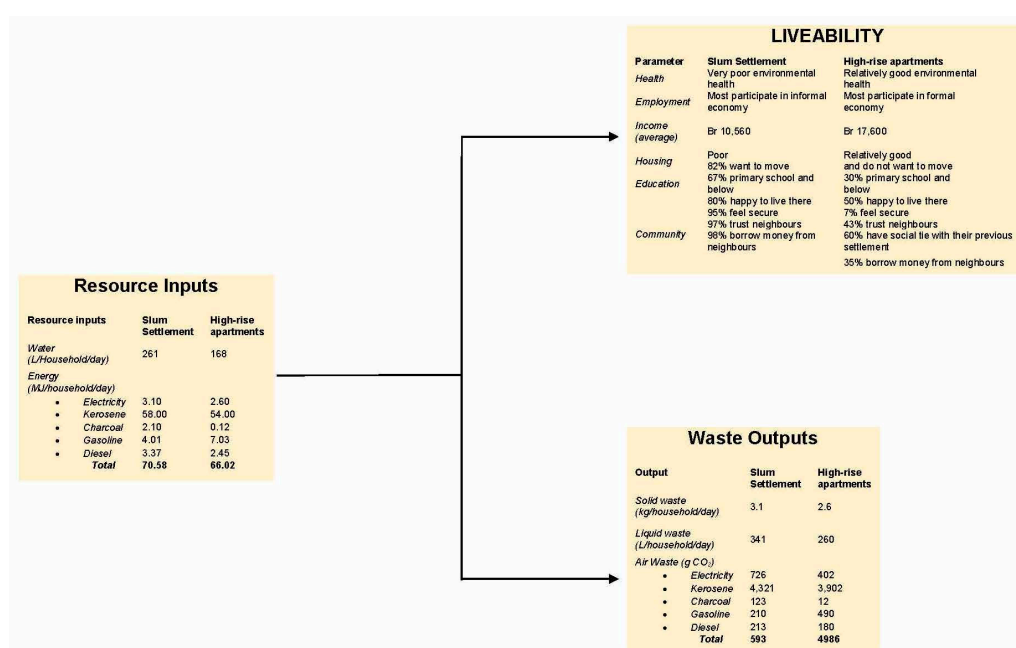


Figure 3. Extended Metabolism of Addis Ababa slum settlements. Source: Authors own data.

However, the biggest difference between the slums and the high-rise projects is the astonishing difference in community trust and networks between the two settlement types. In the slums, people feel secure and borrow tools and money from their neighbors, but this happens much less in the high-rise projects. There are ways this can be understood in terms of design where simple, walkable links are available between slum houses, but in high-rise the units are separated with little consideration of the need for community. There are architects who do find ways of building more community into high-rise developments [45–47], but, as outlined below, it may be a better approach to create Organic in situ development that builds on the social capital in communities whilst enabling better metabolism and better economic outcomes.

### 5.2. SDG Results

The difference between the two approaches—Organic and Modernist—is outlined in more detail to explain the difference in the two approaches, and then these are assessed using the SDG 11 targets.

The Modernist approach is well understood, with a paradigm that entails a clean slate with high-rise architecture enabling a large number of people to have a formal house, with good

infrastructure for energy, water, and waste provided through a centralized utility system. As shown above, this works with metabolism and economic outcomes but does not work with community outcomes. Any other approach would need infrastructure and design that can maintain the metabolism, the economic outcomes, and the community outcomes in an integrated way.

The Organic approach seeks to do this by using a community-based approach to infrastructure and design. The approach uses new technology for energy, water, and waste infrastructure designed to fit within the fabric of the tightly knit slums; it not only improves the economic situation of the slum dwellers, but it is sensitive to the social infrastructure within the organic structure of the slums [48]. This social capital is likely to be a significant contributor to the ending of extreme poverty through its highly inclusive mechanism; it can also be linked to more participatory governance in general [49]. This approach is being developed to manage shared photovoltaic systems in precincts and has been called Citizen Utilities [50]. The same approach can also be used to assist with water and waste management. Both can be upgraded as a local, distributed, community-based approach rather than a highly centralized mechanism, as has been the way in the past. This approach can use a range of small-scale local water and waste systems that can be mostly self-sufficient but also link to the city-wide grids for resilience and reliability [49,51].

With energy, water, and waste systems part of the same Citizen Utility and requiring a strong community-based decision-making approach, the Organic approach will require a formal tenure system to underlie the whole settlement. Such formal recognition of housing titles will enable the formal access to employment, schools, and banking systems to enable house upgrading in situ. Economic development will follow these factors.

The Organic Model is therefore likely to provide economic, social, and environmental opportunities that are more integrated than the Modernist option. The two models are therefore assessed in comparison to the SDG 11 Targets to see how they compare in their ability to provide a more inclusive, safe, resilient, and sustainable settlement. In Table 6, these 7 Targets are examined in terms of their application as shown in the Addis Ababa case study.

**Table 6.** Results of Sustainable Development Goals (SDG) analysis.

<b>Goal 11. Make Cities and Human Settlements Inclusive, SAFE, Resilient, and Sustainable. Target</b>	<b>Organic Community-Based Infrastructure in Situ Slum Development Model</b>	<b>Modernist High-Rise Slum Clearance Development Model</b>
11.1 By 2030, ensure access for all to adequate, safe, and affordable housing and basic services and upgrade slums	Housing already affordable and can be upgraded by owners when given tenure Basic services all available through community utility	Housing subsidized and thus limited. Basic services available through centralized system
11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons	Transport more available as most slums are close to economic activity. Walkable street designs. Need to upgrade for disabled access	Transport depends on location; many high-rise slum clearances placed on urban fringe without good transport
11.3 By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries	Inclusive community already exists and can use as basis for infrastructure management and planning	Poor community inclusion. Planning is imposed
11.4 Strengthen efforts to protect and safeguard the world's cultural and natural heritage	Many old slums are approaching cultural heritage status and can be restored accordingly	Little potential

Table 6. Cont.

Goal 11. Make Cities and Human Settlements Inclusive, SAFE, Resilient, and Sustainable. Target	Organic Community-Based Infrastructure in Situ Slum Development Model	Modernist High-Rise Slum Clearance Development Model
11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations	Disaster management can be significantly improved by community governance system. Water vulnerable settlements will need special care	Little potential
11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management	Waste management and air quality improved by community infrastructure.	Waste management and air quality usually better.
11.7 By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities	Green spaces needed within and around slums as it regenerates organically	Green spaces usually part of high-rise developments

Source: Authors own data based on SDG indicators.

Table 6 suggests that the Organic Model is likely to have better outcomes overall. The cultural target is quite revealing of the fundamental issue behind the two models. It raises the question of whether these slum settlements that have been patched together as temporary shelter but are now in some cases 50 or so years old, some even older, should be seen as a kind of cultural heritage that needs to be built with and improved rather than seeing them as having so little value that they need to be cleared. Organic settlements that have been built over millennia and are now seen as cultural heritage obviously had a similar evolution; at some point, people began to build on their structures and make them more durable [52]. History adds layers of materials and technologies to make them work better. This Organic approach can now be applied to slum settlements by dismissing their image issues, seeing them as potential regeneration sites, adding the community-based infrastructure of the 21st century, and creating more inclusive, safe, resilient, and sustainable habitat for 1 billion people.

## 6. Conclusions

Sustainability has been applied to slum settlements in Addis Ababa using two different sustainability frameworks. Together they show that economic and environmental improvements may be achieved in slum improvements based on slum clearance and high-rise housing in the Modernist tradition. However, the social cohesion of slum communities is lost, and therefore an approach based on more Organic approaches may be more sustainable in the fuller sense of this term. New small-scale technology for infrastructure and building may enable this approach. In reality, some slums are not able to be upgraded, as the material basis of the structures cannot be improved. Thus, sometimes a hybrid of the Modernist and Organic approaches is likely to provide the best option. However, the key issue is to have an Organic approach as the core policy guiding all the interventions.

The Organic Model based on in situ slum upgrading is an instrument that promises to promote empowerment, integrated urban development, and social cohesion, as well as the environmental upgrading and economic development so eagerly desired. This is a more compelling approach against the backdrop of ever-increasing urban unemployment, poverty, and widening socio-economic inequalities, as well as the lack of government funds for large scale Modernist interventions.

Institutional mainstreaming of the Organic approach to slum improvement will require planners and city policy makers to recognize the value in slum settlement patterns and seek to build on the social capital that exists inside the urban fabric. It will require demonstrations of how new technologies

for infrastructure upgrading can make it possible to maintain the community and unleash a process of upgrading that is self-sustaining rather than requiring massive government intervention, as seen in the slum clearance programs. This would make slums into significant contributors to the future sustainable city.

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## References

1. United Nations Human Settlements Programme (UN-Habitat). *World Cities Report 2016—Urbanization and Development—Emerging Features*; UN-Habitat: Nairobi, Kenya, 2016. Available online: <http://wcr.unhabitat.org/> (accessed on 6 December 2017).
2. Hove, M.; Ngwerume, E.T.; Muchemwa, S. The urban crisis in Sub-Saharan Africa: A threat to human security and sustainable development. *Stability* **2013**, *2*, 1–14. [CrossRef]
3. United Nations Human Settlements Programme (UN-Habitat). *Urban Infrastructures and Basic Services, Including Energy*; Habitat III Issue Papers No. 18; UN-Habitat: Nairobi, Kenya, 2015. Available online: <https://www.alnap.org/system/files/content/resource/files/main/habitat-iii-issue-paper-18-urban-infrastructure-and-basic-services-including-energy-2-0.pdf> (accessed on 6 December 2017).
4. Abraham, T. Problems and prospects of housing development in Ethiopia. *Prop. Manag.* **2007**, *25*, 27–53. [CrossRef]
5. Teferi, Z.A.; Newman, P. Older Slums in Addis Ababa: How Do They Work? 2014. Available online: <http://www.erepository.cu.edu.et/index.php/ENG-Conf/article/view/5259> (accessed on 6 December 2017).
6. World Bank Group (WBG). City Strength Resilient Cities Program: Addis Ababa, Ethiopia—Enhancing Urban Resilience. Available online: <http://documents.worldbank.org/curated/en/559781468196153638/pdf/100980-REVISED-WP-PUBLIC-Box394816B-Addis-Ababa-CityStrength-ESpread-S.pdf> (accessed on 6 December 2017).
7. United Nations Human Settlements Programme (UN-Habitat). *Streets as Tools for Urban Transformation in Slums—An Approach to Citywide Slum Upgrading*; UN-Habitat: Nairobi, Kenya, 2014. Available online: <https://unhabitat.org/books/streets-as-tools-for-urban-transformation-in-slums/> (accessed on 6 December 2017).
8. Jacobs, J. *The Death and Life of Great American Cities*; Vintage: New York, NY, USA, 1961.
9. United Nations Human Settlements Programme (UN-Habitat). *The State of African Cities Report—Governance, Inequalities and Urban Land Markets*; UN-Habitat: Nairobi, Kenya, 2010. Available online: <https://unhabitat.org/books/state-of-african-cities-2010-governance-inequalities-and-urban-land-markets-2/> (accessed on 6 December 2017).
10. Regassa, B.; Regassa, N. Housing and poverty in southern Ethiopia: Examining affordability of condominium houses in Hawassa city. *Econ. Sociol.* **2015**, *8*, 155–169. [CrossRef] [PubMed]
11. Durand-Lasserve, A.; Selod, H. Chapter 5: The formalization of urban land tenure in developing countries. In *Urban Land Markets—Improving Land Management for Successful Urbanization*; Lall, S.V., Freire, M., Yuen, B., Rajack, R., Helluin, J.J., Eds.; Springer: Dordrecht, The Netherlands, 2009; Volume 1, pp. 101–132.
12. Ngau, P.; Philip, O.; Mbilo, J.; Mutua, M.; Achieng, J. Approaches to Informal Settlement Upgrading in East Africa: The Challenge of Sustainable Up-Scaling of Informal Settlement Upgrading. In Proceedings of the Regional Conference, Nairobi, Kenya, 11 July 2012; Centre for Urban Research and Innovations, School of the Built Environment, University of Nairobi: Nairobi, Kenya, 2012.
13. Newman, P.; Kenworthy, J. *Sustainability and Cities—Overcoming Automobile Dependence*; Island Press: Washington, DC, USA, 1999.
14. Newman, P. Sustainability and cities: Extending the metabolism model. *Landsc. Urban Plan.* **1999**, *44*, 219–226. [CrossRef]



15. Newman, P.; Beatley, T.; Boyer, H. *Resilient Cities—Overcoming Fossil Fuel Dependence*; Island Press: Washington, DC, USA, 2017; Volume 2.
16. Sachs, J. Sustainable Development Economics. Available online: <https://www.project-syndicate.org/commentary/promote-sustainable-development-economics-by-jeffrey-d-sachs-2014-11?barrier=accessreg> (accessed on 1 November 2017).
17. Sachs, J. *The Age of Sustainable Development*; Columbia University Press: New York, NY, USA, 2015.
18. Wolman, A. The metabolism of cities. *Sci. Am.* **1965**, *213*, 179–190. [[CrossRef](#)] [[PubMed](#)]
19. Minx, J.C.; Creutzig, F.; Medinger, V.; Ziegler, T.; Owen, A.; Baiocchi, G. *Developing a Pragmatic Approach to Assess Urban Metabolism in Europe: A Report to the Environment Agency*; Climatecon Working Paper 01; Technische Universität Berlin and Stockholm Environment Institute: Berlin, Germany, 2010. Available online: <http://ideas.climatecon.tu-berlin.de/documents/wpaper/CLIMATECON-2011-01.pdf> (accessed on 6 December 2017).
20. Commonwealth of Australia. *State of the Environment Report*; CSIRO: Collingwood, Australia, 1996. Available online: <https://soe.environment.gov.au/sites/g/files/net806/f/1996-soe.pdf?v=1487244614> (accessed on 6 December 2017).
21. Thomson, G.; Newman, P. Urban fabrics and urban metabolism: From sustainable to regenerative cities. *Resour. Conserv. Recycl.* **2017**. [[CrossRef](#)]
22. Thomson, G.; Newman, P. Geoengineering in the anthropocene through regenerative urbanism. *Geosciences* **2016**, *6*, 46. [[CrossRef](#)]
23. Webb, R.; Bai, X.; Smith, M.S.; Costanza, R.; Griggs, D.; Moglia, M.; Neuman, M.; Newman, P.; Newton, P.; Norman, B.; et al. Sustainable urban systems: Co-design and framing for transformation. *Ambio* **2017**. [[CrossRef](#)] [[PubMed](#)]
24. Perry, N.; Greenhalgh, H.; Cong, M.H.; Liu, H.; Zhang, Y. *An Exploration of the Implementation and Sustainability of Urban Area Policies Aimed at Millennium Development Goals #1 and #7*; Report Prepared for the Division for Public Administration and Development Management (DPADM), United Nations Department of Economic and Social Affairs (UNDESA); USC Sol Price School of Public Policy, University of Southern California: Los Angeles, CA, USA, 2014. Available online: <http://workspace.unpan.org/sites/Internet/Documents/UNPAN93524.pdf> (accessed on 6 December 2017).
25. Millington, K.A.; Cleland, J. *Counting People and Making People Count: Implications of Future Population Change for Sustainable Development*; K4d Helpdesk Report; Institute of Development Studies: Brighton, UK, 2017. Available online: <https://opendocs.ids.ac.uk/opendocs/handle/123456789/13015> (accessed on 6 December 2017).
26. Ley, D. Chapter 4: Modernism, post-modernism and the struggle for place. In *The Power of Place (Role Social and Cultural Geography): Bringing Together Geographical and Sociological Imaginations*; Agnew, J.A., Duncan, J.S., Eds.; Routledge: Oxon, UK, 2014; pp. 44–65.
27. Trancik, R. *Finding Lost Space: Theories of Urban Design*; John Wiley and Sons: New York, NY, USA, 1986.
28. Werlin, H. The slum upgrading myth. *Urban Stud.* **1999**, *36*, 1523–1534. [[CrossRef](#)]
29. Turner, J.F.; Fichter, R.E. *Freedom to Build: Dweller Control of the Housing Process*; Macmillan: New York, NY, USA, 1972.
30. United Nations Human Settlements Programme (UN-Habitat). *Enabling Shelter Strategies: Review of Experiences from Two Decades of Implementation*; UN-Habitat: Nairobi, Kenya, 2006. Available online: <http://www.chs.ubc.ca/archives/files/HS-785.pdf> (accessed on 6 December 2017).
31. Singh, P.; Khosla, R. *Resettlement of Slum Dwellers—A Handbook for City Government*; Centre for Urban and Regional Planning: New Delhi, India, 2008.
32. Jha, G.; JKhosla, R. *Economics of Resettling Low-Income Settlements (Slums) in Urban Areas—A Case for Site Upgrading*; Final Report; South Asia Network of Economic Research Institute: New Delhi, India, 2005.
33. Dupont, V. Slum demolitions in Delhi since the nineties: An appraisal. *Econ. Political Wkly.* **2008**, *43*, 79–87.
34. Takesada, N.; Manatunge, J.; Herath, I.L. Resettler choices and long-term consequences of involuntary resettlement caused by construction of Kotmale Dam in Sri Lanka. *Lakes Reserv. Res. Manag.* **2008**, *13*, 245–254. [[CrossRef](#)]
35. United Nations Human Settlements Programme (UN-Habitat). *Cities and Climate Change: Global Report on Human Settlements 2011*; UN-Habitat: Nairobi, Kenya, 2011. Available online: <https://unhabitat.org/cities-and-climate-change-global-report-on-human-settlements-2011/> (accessed on 6 December 2017).

36. Gossaye, A. Inner-city renewable and locational stability of the poor: A study of inner-city renewal program in Addis Ababa, Ethiopia. *WIT Trans. Ecol. Environ.* **2000**, *39*, 437–446. [[CrossRef](#)]
37. Abebe, G.; Hesselberg, J. Community participation and inner-city slum renewal: Relocated people's perspectives on slum clearance and resettlement in Addis Ababa. *Dev. Pract.* **2015**, *25*, 551–562. [[CrossRef](#)]
38. Aman, M. Development Induced Displacement in the Context of un Guiding Principles and au Convention: Experience from Addis Ababa City Urban Renewal Projects. Ph.D. Thesis, Addis Ababa University, Addis Ababa, Ethiopia, 2016.
39. Burra, S. *Resettlement and Rehabilitation of the Urban Poor—The Story of Kanjur Marg*; Working Paper No. 99; Society for the Promotion of Area Resource Centres: New Delhi, India, 1999.
40. Yntiso, G. Urban development and displacement in Addis Ababa: The impact of resettlement projects on low-income households. *East. Afr. Soc. Sci. Res. Rev.* **2008**, *24*, 53–77. [[CrossRef](#)]
41. Ejigu, A.G. The Making of 'Modern' Addis: The Role of the 'Addis' Myth. In Proceedings of the Biennial Conference of the International Association for the Study of Traditional Environments, Portland, OR, USA, 4–7 October 2012.
42. Wubneh, M. Addis Ababa, Ethiopia—Africa's diplomatic capital. *Cities* **2013**, *35*, 255–269. [[CrossRef](#)]
43. Arief, A. A Sustainability Assessment of Squatter Redevelopment in Jakarta. Master's Thesis, Murdoch University, Perth, Australia, 1998.
44. Central Statistical Agency (CSA). *Ethiopia Demographic and Health Survey 2016: Key Indicators Report*; CSA: Addis Ababa, Ethiopia, 2016. Available online: <http://microdata.worldbank.org/index.php/catalog/2886/export> (accessed on 6 December 2017).
45. Bay, J.H. Sustainable community and environment in tropical Singapore high-rise housing: The case of bedok court condominium. *Archit. Res. Q.* **2004**, *8*, 333–343. [[CrossRef](#)]
46. Bay, J.H.; Ong, B.L. *Tropical Sustainable Architecture: Social and Environmental Dimensions*; Architectural Press: Oxford, MA, USA, 2006.
47. Bay, J.H. Towards a fourth ecology: Social and environmental sustainability with architecture and urban design. *J. Green Build.* **2010**, *5*, 176–197. [[CrossRef](#)]
48. Teferi, Z.A.; Newman, P. Improvement of slums in Addis Ababa: Moving towards community-sensitive distributed infrastructure. *Urbanization* **2017**, forthcoming.
49. MacPherson, L. Participatory approaches to slum upgrading and poverty reduction in African cities. *Hydra* **2013**, *1*, 85–95.
50. Green, J.; Newman, P. Citizen utilities: The emerging power paradigm. *Energy Policy* **2017**, *105*, 283–293. [[CrossRef](#)]
51. Cowden, J.R. Planning and Adaptation Measures for Urban Slum Communities in West Africa: Stochastic Rainfall Modeling Applied to Domestic Rainwater Harvesting and Climate Change Adaptation. Ph.D. Thesis, Michigan Technological University, Houghton, MI, USA, 2008.
52. Girouard, M. *Cities and People*; Yale University Press: New Haven, CT, USA, 1985.



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## Publication 2: Co-author statements

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(Zafu Assefa Teferi **(80% Contribution)**)

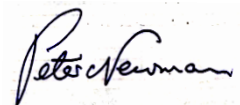
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Date 15.12.2017



I, as co-author, endorse that this level of contribution by candidate indicated above is appropriate

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# **‘Older Slums in Addis Ababa, Ethiopia: How do they work?’**

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## **Abstract**

Slum settlements in Addis Ababa have emerged in the built up area of the old city of Addis Ababa (Addis Ketema) for over 50 years, and new slums are scattered throughout the rest of the city. The aim of this paper is to assess the operational qualities of households in older slum settlements of Addis Ababa, in terms of selected parameters. The survey of 100 sample households reveals that the slum households have only modest access to most basic services. Housing units are very overcrowded and in poor physical condition. It is suggested that such a settlement would be best improved by providing common municipal services required in day-to-day life. This paper has shown that there is nothing about the age of a settlement that ensures it will be upgraded; there will need to be an intervention strategy at some time.

**KEY WORDS:** basic services, intervention, health, slum upgrading

## 1. Introduction

Most economic growth in developing countries over the past 50 years has been in hyper urbanized primate cities. Primate cities by virtue of their position in the urban hierarchy and concentration of economic activities usually attract capital investment for employment, educational and other opportunities. In most instances however, they fail to absorb the ever-increasing demand for affordable housing and associated support infrastructure. Thus in all these rapidly growing cities there is a large proportion of slums.

The U.N Habitat Report (2003) suggests that Sub-Saharan Africa has the highest level of their urban populace in slums at around 72 per cent. Around 32 per cent of global urban population and 43 per cent of urban populations in the developing world live in slums. South Central Asia has a slum population of 262 million, representing 58 per cent of the total urban slum population of the world. By far the greatest share of health problems in rapidly urbanizing contexts is attributable to living and working conditions found in slums.

Slums are generally characterized by four main conditions:

- They are illegal and hence often do not have formalized tenure. This leads to social and economic exclusion due to lack of formal recognition in their address and hence slum dwellers regularly encounter different forms of deprivation (Mrkel and Otai 2007).
- They are vulnerable as they are built on steep slopes or river banks as that is the only land available. Mud slides and floods often mean they are very dangerous places to live and hence authorities are often looking to have them moved (UN Habitat, 2009).
- They are usually not old as informal settlements that have been put up in former times are incorporated generally into the formal city and upgraded to make them seamlessly part of the city (Newman and Kenworthy, 1999).



- They are poorly serviced with basic infrastructure leading to inadequate and overcrowded housing, un-healthy and un-safe working conditions, lack of access to clean water and decent sanitation (Wagstaff, 2002; Newman, 2009). This paper will try to understand the interactions between these factors in a slum settlement in Addis Ababa.

## **2. Background Context**

Addis Ababa extends over an area of 530 square kilometers. It is the administrative centre of the country and continues to be one of the major industrial cities. Addis Ababa is a city of many contrasts. As one of the most industrialized cities in the country it shows a sign of vitality and yet of deterioration. It shows signs of transformation to world city status and yet of declining living standards for a large segment of its population.

Accommodating 30 percent of the urban population of Ethiopia, Addis Ababa the capital of Ethiopia and the diplomatic center of Africa is one of the fastest growing cities in the continent. Like many cities in the developing world, Addis Ababa has experienced a rapid rate of urban growth in recent times. The population of the city has increased from 0.44 million to 3.34 million between 1961 and 2015. The growth rate of Addis Ababa is expected to continue by 2.1 per cent during 2011-2025 and the total population of the city is expected to increase to 4 million in 2025 (Central Statistics Authority of Ethiopia, 2012). Available Data indicates that the stocks of housing units are not sufficient and adequate to meet the growing population. Consequently, to this state of affairs a large proportion of households have had to find or invent settlement solutions for themselves outside the rule of planning and housing regulations. A clear indicator of this situation is the growth of unauthorized settlements and housing practices. Internal migration has contributed to the existing housing problem and has increased the number of slums.

Currently, about two-thirds of the city residents are living in slums. According to the Ministry of Finance and Economic Development, (2012) about 28 per cent of the people residing in Addis Ababa are engaged in life below the minimum threshold (poverty line). Such deprivation is usually related to their housing situation.

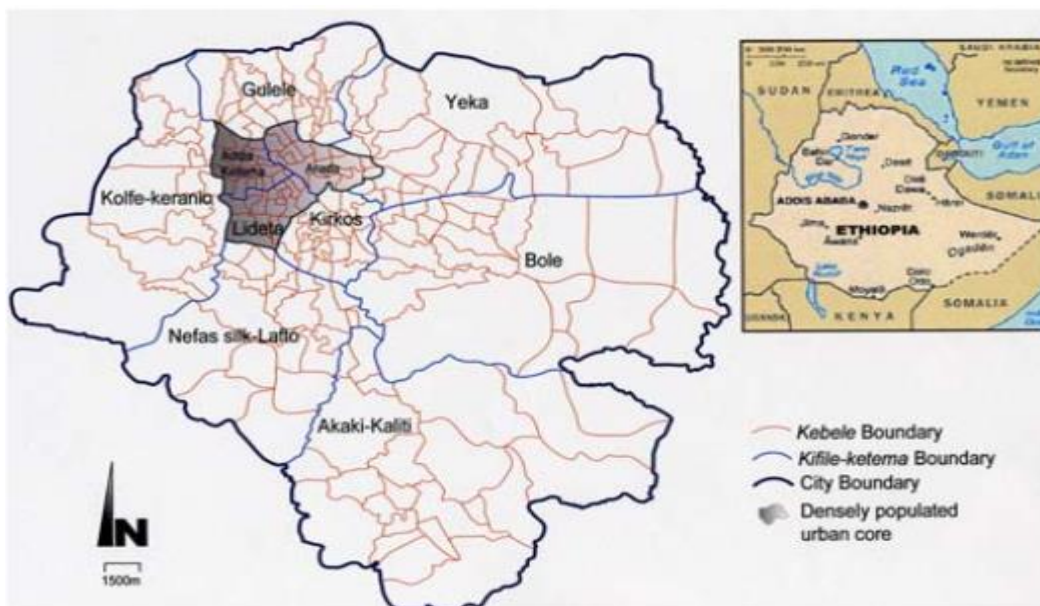
‘Older Slums in Addis Ababa, Ethiopia: How Do They Work?’ *Zafu Assefa Teferi, Peter Newman*

While Addis Ababa offers many opportunities for residents to benefit from education, health and social services and to improve their health and quality of life, at the same time its urban slums are creating economic, social and environmental problems that must be addressed.

Therefore, the aims of this study were to assess housing conditions and availability of service facilities in the city of Addis Ababa slums. For this study, service facilities of slum dwellers is evaluated in terms of dwelling place, source of drinking water, sewerage system, electrification, latrine facilities, drainage system, garbage disposal and access to health facilities.

The slum that is the focus of this research is Addis-Ketema. This slum is around 50 years old and has essentially grown with the city from its origins as a small Ethiopian town. Most of its houses are over 50 years old. It is centrally located (see Figure 1) and is not built on highly vulnerable land though because of lack of drainage it is subject to flooding. It has formalized tenure and its housing is over 70% owned by the government. It is therefore not an informal settlement but appears to have all the characteristics of an urban slum in terms of its basic services. It has a population of some 271,644 people with an area of 7.41 km<sup>2</sup>.

**Figure 1: map of Addis Ababa City**



**Source: Daniel et al., (2010)**

### **Participatory budgeting as a way to improve slums**

Participatory budgeting is relevant to the context of Addis Ababa as the city possesses the right governance structure for developing this policy. Indeed, to successfully implement participatory budgeting, a mayor needs to have discretionary power over the budget. In this way, (s)he can decide to allocate a certain percentage for participatory budgeting. This is the case of Addis Ababa, where the budget is managed at the city level.

In addition, participatory budgeting works at a neighbourhood scale. Each neighbourhood elects a group of representatives to discuss the budget. In this context, participatory budgeting would be an efficient way to re-adjust the mismatch between the amount of tasks Kebeles have to complete and the lack of allocated budget. Finally, a low-cost housing development program has been implemented by the municipality to address urban issues. It has shown positive results both in addressing the housing situation and tackling poverty alleviation. However, these positive impacts have been diminished by the lack of relevancy of some parts of the project, and the lack of transparency and accountability (Yenoineshet Meazah Haregewoin, 2014). Participatory budgeting could comprehensively address these issues.

### **3. Data and Methods**

The study is part of a bigger research project that will examine five informal settlements in Addis Ababa. The five include three slums that have hardly changed since they began, the oldest being Addis-Ketema. Addis-Ketema slum was selected as the first to have data collected and the others were surveyed recently but the data has not yet been analyzed. The slum was selected purposively because of its large size and its age – it is over 50 years since it was built as part of the foundation of Addis Ababa.

The study was based on a three stage random sampling technique. In the first stage Addis-Ketema sub-city was selected and in the second stage Taliyan Sfer slums and finally households were selected. Data was collected randomly from sample households of Taliyan Sefer slum through a field survey. This slum was selected purposively because of its large size. A well designed pre-tested questionnaire was used to gather the essential information on

demographic characteristics, housing condition, and sources of drinking water, electricity, toilet, drainage facility and income of the households.

#### 4. Slum Households and Housing Conditions

##### 4.1 Demographic Characteristics of Sample Households

The following table indicates that out of the 100 sample slum dwellers 63.2 per cent were male and 52.8 per cent were female, 65.0 percent were married; 12.0 percent were unmarried; 6.0 per cent were divorced and 17.0 per cent were widows. Regarding religion it was revealed that around three quarters of the persons living in the Addis-Ketema slum were christians. The age structure of the respondents reveals that 12.6 percent were up to 20 years, 75.4 percent were between 25-59 years and 12.0 percent were above 60 years. The median age of the slum households was around 27 years.

Out of the total number of sample slum households 18.3 per cent were illiterate, 35.4 per cent were educated to primary level, 44.7 percent secondary and 1.6 per cent were tertiary. Two of each five households had 5 and more persons in their family units while another 55.0 per cent of households had 2-4 persons in their household, the average household size is about 5.4 persons. The occupation of the sample slum households shows that 40.5 per cent were in small business, 6.5 per cent were engaged in urban agriculture respectively and 53 percent were in other occupations like house maids and other informal employment.

**Table 1: Socio-economic condition of sample slum households**

<b>Socio-economic Categories of Households Categories</b>	<b>Percent</b>
<b>Age Grouping in years</b> < 20 years	12.6
25-59 years	75.4
60> years	12.0
<b>Sex Male</b>	63.2
Female	52.8
<b>Religion</b> Christian	68.2
Muslim	31.2
Others	0.6
<b>Level of education</b> Illiterate	18.3
Primary	35.4

Secondary Tertiary	44.7 1.6
<b>Marital status</b> Married	65.0
Unmarried	12.0
Divorced	6.0
Widows	17.0
<b>Household size</b> (Persons ) <2	7.7
2-4	55.3
5 >	37.0
<b>Occupation</b> Small business	40.5
Agriculture	6.5
Others	53
<b>Average income</b> (in Birr) <500	6.3
501- 1000	5.4
1001- 1500	20.6
1501-2000	50
2000 >	17.7

**Source: Field survey, 2014**

#### **4.2 Housing Conditions of Slum Households**

The symptoms of rapid urban population growth are all too familiar as found from several research undertakings in developing countries in particular. Public authorities could not meet the complex, changing and unprecedented housing needs of growing populations adequately. In fact sheer failure to anticipate population growth has apparently been a major source of weakness of housing polices. Most houses in Addis-Ketema were constructed without a plan and they are not repaired in a timely manner. Most of the inhabitants in Addis-Ketema are living in 50 year-old houses that are currently damaged and in bad conditions. Table-2 shows that the roof of 80.5 per cent houses is made of brick and cement while the roof of 11 per cent of houses is made of tin. The roofs of the remaining 16.4 per cent of houses are made of mud and or stone. The table also shows that the walls of 22.0 per cent of the houses are made of brick and cement. And the walls of 19.7 per cent and 57.3 per cent of houses are made of tin and mud or stone respectively.

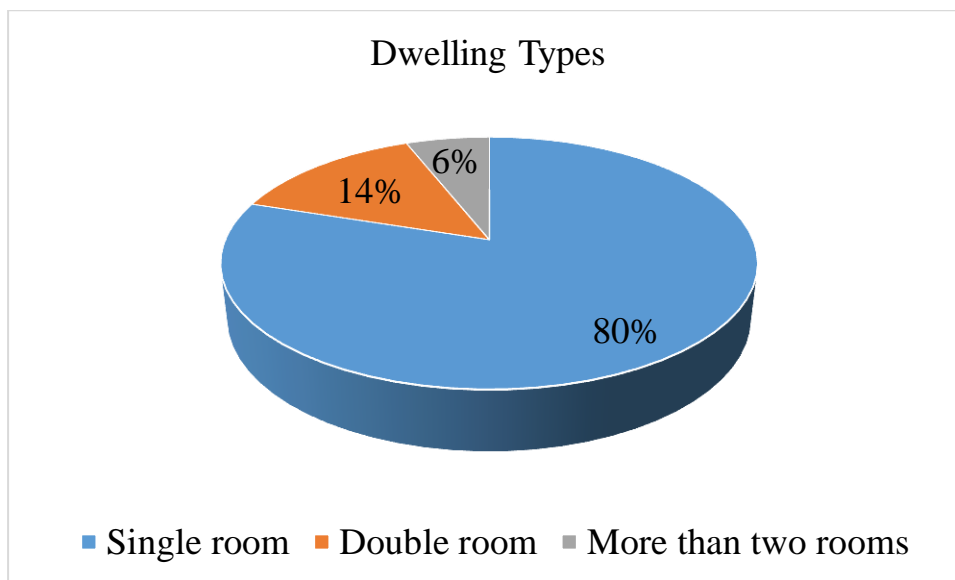
**Table 2: Material Used in Wall and Roof of sample Slum Household**

Materials Used	Roof		Wall	
	No Sample Households	Per cent	No Sample Households	Per cent
Brick or cement	03	3.0	22	22.0
Corrugated iron	81	80.6	20	19.7
Mud and or stone	16	16.4	58	57.3
Total	100	100.0	100	100.0

Source: Field survey, 2014

Most of the sample households i.e. 80.0 per cent live in single-room houses (Figure-2). In most of the households; four or more household members live in one overcrowded dwelling. About 14.0 per cent houses are of double-room dwellings and the remaining 6.0 per cent with more than three rooms. Mostly households with extended family members live in these housing units.

**Figure 2: Dwelling types of sample slum households**



Source: Field survey, 2014

The majority of households have no cooking space. Figure- 3 shows that less than half i.e. 45.0 per cent of the total slum households have cooking facilities in their dwellings and 30.0 per cent of slum households' use their living room for cooking. Another 17.0 per cent of the households cook in open spaces and face serious problem during the rainy season. The remaining 8.0 per cent slum households (who are mostly living as single) usually eat already cooked food. They have no cooking facilities in their dwellings. One of the respondents said, "Houses are too small to accommodate their families and it only holds some house utensils and two beds. Half of the family members spend the nights on the unlined floors, sleeping on old mattress." As observed, there was about a meter of space between the edge of the bed and the door, where, she cooks and sleeps all in the same room. Residential houses and latrines are constructed very close to each other.

**Table 3: Cooking facilities in sample slum households**

<b>Cooking facilities</b>	<b>Number of sample households</b>	<b>Percentage</b>
Having cooking space	45	45.0
Cooking in an open space	17	17.6
Cooking in a living room	30	29.4
No cooking arrangements	08	8.0
Total	100	100.00

**Source: Field survey, 2014**

### **4.3 Available Facilities in Sample Slum Households of Addis Ababa City**

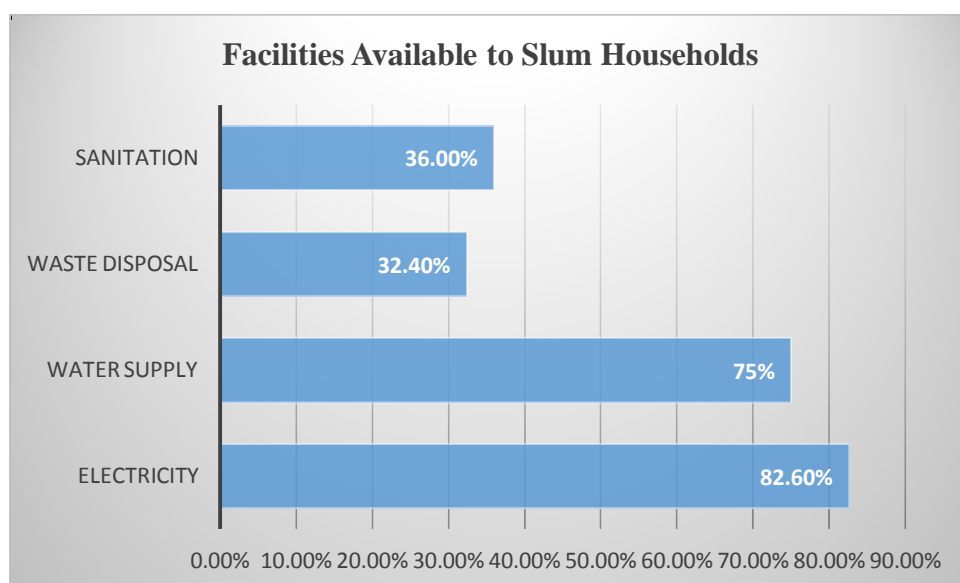
Even if the slum dwellers have been living a long time in the city they have little access to urban infrastructure facilities. Most of the urban poor i.e. 82.6 per cent have access to electricity but their access is inadequate and irregular. Unlike the other parts of Addis Ababa city where the residents use electricity for cooking, washing and refrigeration, Addis Ketema slums use electricity only for lightening.

With regard to water services most of the inhabitants (75%) do not have their own water tap. They also buy water either from community sources known as 'bonno' or from private people who sell water. Figure 4 shows that water supply is inadequate and insufficient. Slum dwellers mostly use public places for bathing and washing. Sometimes 'bonno' water is not

‘Older Slums in Addis Ababa, Ethiopia: How Do They Work?’ *Zafu Assefa Teferi, Peter Newman*

clean due to unclean water sources, mainly caused by floods and old water pipes. When water quality is affected by flooding it is often announced through the media, mainly the radio. But considering the circumstances of the respondents, not all have access to radios and thus have limited access to information.

**Figure 4: Access of Urban Infrastructure Facilities of Slum household**



**Source: Field survey, 2014**

As shown on figure 4, only 36.0 per cent of the total households have access to city sewerage systems. Only 32.4 per cent of the respondents have access to community waste disposal services and the remaining of them throw their waste in open spaces and streams. In most cases toilets frequently get filled since they are used by large groups of people. Timely cleaning is a problem due to lack of suction trucks as well as the expense involved. This has forced people to throw their human waste in any open space or road they find, and others squat in the open air. They dump liquid human wastes into the open drainage canals (passing by their front doors) using a poppo (chamber pot). Waste from toilets is channeled into the river, ditches and drainage canals in many cases. According to some secondary sources, solid waste disposal services cover about 55% but liquid waste disposal only 2% of the population



in Addis Ababa (Tezera and Neka-Tibeb, 2014). In this assessment, the majority of the respondents said that the waste disposal services and facilities for both liquid and wastes are far from satisfactory, mainly caused by the inadequacy of services and facilities and ignorance regarding proper utilization of the existing services.

#### 4.4 Health conditions

Poverty in general and specifically poor environmental sanitation, inefficient potable water, population density, poor housing, inadequate sanitation facilities, and lack of awareness are major contributing factors to poor health. In a focus group discussion, an elderly man said, *“The environment in which we live is very unclean and congested. It’s polluted with dirty and overflowing toilets. Hence, it’s not safe in terms of health and we are contributing to this pollution”* Another person said that *“during the rainy season, sewage flows by my house and this is a very big problem for my family”* The researcher also observed that there were very bad smells as I crossed the neighborhoods and while conducting this study. Every kind of solid and liquid waste is disposed of openly in the canals. Table (3) shows access to health facilities for the sample of slum dwellers for the last 12 months. 90% were visiting government hospitals or clinics for their treatment. Only 10% of the sample of households did not have hospital/clinic or pharmacy facility available to them.

**Table 4: Availability of Health Service**

Details	Number of households	Percentage
Availability of hospital/clinic or pharmacy		
a) Yes	74	74.3
b) No	26	25.7

## 5. Discussion

Addis-Ketema is a very old settlement, it has formalized tenure for its residents (though this is only rental) and it is not on highly vulnerable land. However all the data show that it remains highly deprived in terms of its basic services and hence is unhealthy and difficult for its residents. When Addis Ababa was a small town it began attracting such informal settlements and yet at no stage in its history did Addis-Ketema improve its basic services. Its characteristics remain like any other slum settlement in Addis Ababa or any other developing country city. Its residents remain trapped in poverty. To break out of their situation there will need to be significant intervention. Addis-Ketema shows that although the other conditions such as formalized tenure and lack of vulnerability should help in creating a better settlement, there is a need to prioritize policy intervention around providing basic services.

What has caused this lack of basic services?

1. Urban areas in Ethiopia are expanding without a proper plan, paving the way for visible urban poverty that leaves behind older settlements like Addis-Ketema. This fast rate of urbanization without corresponding expansion in basic services creates a lot of pressure that is manifested in poverty and unemployment. Melakeselam in Emebet (2008) stated that the social consequence of such rapid growth has been alarming. The overcrowded situation in the city has caused a shortage in terms of employment and adequate housing with proper facilities.
2. Urban poverty in Ethiopia is highly connected with the lack of employment opportunities. According to a report by the Central Statistics Authority of Ethiopia (2012), the rate of unemployment for urban areas was 20.4 per cent in the year 2011. Unemployment seems to be an urban experience in the country, being prevalent mainly in the cities. Youth constitutes the greater part of the unemployed especially with those having only modest levels of formal education. “In urban areas, female-headed households have been found to have higher poverty incidence, depth and severity than their male counter parts”. This shows that female-headed households are

more susceptible to different sorts of urban shocks than male-headed households (ibid, 2012).

3. Lack of policy intervention. Despite the rapid growth and unemployment the long term existence of the slum at Addis-Ketema would suggest that there just has been a lack of intervention at the scale needed to establish basic services in the settlement.

## **6. Conclusions**

The poor quality of the housing in low level environmental surroundings, scarcity of potable water supply, poor sanitation, absence of street lights, use of low quality of fuel, absence of garbage disposal and poor drainage are the common features of slum households in Addis-Ketema. Despite the age of the settlement and its comparative advantage in having formalized tenure the slum seems to be little better than other parts of Addis Ababa.

Lack of pro-poor government policy that can be targeted on the absence of basic services programs appears to be the major need to address the issues of Addis-Ketema. The government has to prepare a special housing policy for poor settlements like Addis-Ketema that can provide the common municipal services required in day-to-day life. Households living in dilapidated houses are likely to be rehabilitated once basic services are provided.

The new approach of participatory budgeting may be the best way to finance and prioritize such basic services (Gollagher and Hartz-Karp, 2013; Licha, 2004). Involving the actual people who the services need will help provide the best mechanism for determining where resources are needed first and how significant they could be. The approach also guarantees that corruption is minimized and where local labour can be used.

The next phase of this research will expand the survey of slums in Addis Ababa to include three others that have different characteristics and two that have been upgraded to see how effective this has been. This paper has shown that there is nothing about the age of a settlement that ensures it will be upgraded; there will need to be an intervention strategy at some time.

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### **References:**

- Adam W., (2002), “Poverty and Health Sector In-equalities” Bulletin of WHO, 2002, 80 (2)
- Central Statics Authority, (2012), Analytical report on Urban Employment Unemployment Survey. Addis Ababa Ethiopia.
- Daniel, D; Tsutsumi, J., & Bendewald, M. J. (2010). Urban environmental challenges in developing cities: the case of Ethiopian capital Addis Ababa. *World Academy of Science, Engineering and Technology, International Journal of Environmental, Chemical, Ecological, Geological and Geophysical Engineering*, 4(6), 164-169.
- Ellis, F and Tassew, W (2005). Ethiopian Participatory Poverty Assessment, 2004-2005, Addis Ababa, Ethiopia
- Emebet, M., (2008), *Urban Poverty in Ethiopia: The Economic and Social Adaptation of Women*, Addis Ababa University press, Addis Ababa.
- Goitom,G. (1996). “Aspect of Poverty in the City of Addis Ababa: Profile and Policy Implication”, In the Ethiopian Economy Poverty and Poverty Alleviation, Proceedings of the Fifth Annual Conference on the Ethiopian Economy, Addis Ababa, Ethiopia.
- Gollagher M and Hartz-Karp J., (2013), ‘The Role of Deliberative Collaborative Governance in Achieving Sustainable Cities’ *Sustainability*. Vol 5, No.6, pp. 2343-2366
- Haregewoin YM. (2007). Integrated housing development programs for urban poverty alleviation and sustainable urbanization: the case of Addis Ababa. In ENHR International Conference on Sustainable Urban Areas. Rotterdam.

- Licha I (2004) *Citizens in charge: managing local budgets in East Asia and Latin America*, Inter American Bank.
- Melake Selam P., (1997), “Some Aspects of Survival Strategies of the Poor Inhabitants of the City of Addis Abab”, In Emebet, M (2008), *Urban Poverty in Ethiopia: The Economic and Social Adaptation of Women*, Addis Ababa University press, Addis Ababa.
- Merkel, S and Otai, J (2007): “Meeting the Health Needs of the Urban Poor in African Informal Settlements: Best Practices and Lessons Earned” Nairobi.
- Ministry of Finance and Economic Development (2012). *Ethiopia’s Progress towards Eradicating Poverty: An Interim Report on Poverty Analysis Study (2010/11)*.
- Newman P and Kenworthy J., (1999), *Sustainability and Cities*, Island Press, Washington DC.
- Newman, P., (2009), *Planning and Sustainable Urban Development: Linking the Green and Brown Agendas*, in UN Global Review of Human Settlements-2008, United Nations Habitat, Nairobi.
- Samson, K, (2012), “Cities as Engines of Economic Growth and Transformation in Ethiopia”, In ed Samson, K, *Do Urban Centers Matter for Growth*, Lesan printing press, Addis Ababa, Ethiopia.
- Tezera, F and Neka-Tibeb, H (2014), *Baseline Study of Health and Nutritional Status of underprivileged Women and Children in Addis Ababa*, WFP Urban Women Fortified Food Facility, Addis Ababa.
- UN Habitat (2003). *The challenge of Slums; Global Report on Human Settlements*, United Nations Human Settlements Programme, London, Earth Scan Publication Ltd.
- UN Habitat (2007). “What are slums and why do they exist”? *Global Report on Human Settlements*, United Nations Human Settlements Programme, Nairobi, Kenya.
- UN Habitat (2009) *Planning and Urban Development*, in *UN Global Review of Human Settlements-2008*, United Nations Habitat, Nairobi.

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### To whom it may concern

I, Zafu Assefa Teferi, contribute 70% of the paper/publication entitled

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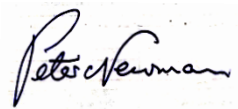
Signature of candidate

Date 15.12.2017



I, as co-author, endorse that this level of contribution by candidate indicated above is appropriate

Co-author 1 Professor Peter Newman **(15 % Contribution)**



Signature:

Date 15.12.2017

Co-author 2 Dr Anne Matan **(15% Contribution)**

Signature:



Date 15.12.2017



The book cover features a photograph of a sunset over the ocean. The sun is a bright yellow orb on the horizon, with its light reflecting on the water and creating a lens flare effect. The sky transitions from a pale yellow near the sun to a soft orange and then to a light grey at the top. The ocean is dark with gentle waves. The foreground shows a sandy beach with some ripples. The title 'INDIAN OCEAN FUTURES' is printed in a large, serif font, with 'INDIAN OCEAN' in a smaller size above 'FUTURES'. Below the title is the subtitle 'Communities, Sustainability and Security' in a smaller, italicized serif font. At the bottom, the editors' names 'Edited by Thor Kerr and John Stephens' are listed in a serif font.

# INDIAN OCEAN FUTURES

*Communities, Sustainability and Security*

*Edited by*

Thor Kerr and John Stephens

Chapter Five .....	67
Heritage and Protest at the Guildford Hotel	
<i>John Stephens</i>	
<b>Mobilizing Technologies for Sustainable Community</b>	
Chapter Six .....	90
Cultural Models on the Western Australian Coast: Improving Sustainability Outcomes	
<i>Laura Stocker and Jenny Shaw</i>	
Chapter Seven .....	122
A Collaborative Approach to Coastal Adaptation to Sea Level Rise in the Southwest of WA	
<i>Laura Stocker, Gary Burke, Svetla Petrova and Bob Pokrant</i>	
Chapter Eight .....	154
Applying a Sustainable Development Model to Informal Settlements in Addis Ababa	
<i>Zafu Teferi, Peter Newman and Annie Matan</i>	
Chapter Nine.....	170
Sustainability Accounting for Natural Resource Management in Bangladesh	
<i>Mahmood Hasan Khan, Amzad Hossain and Dora Marinova</i>	
<b>Change and the Discursive Frontiers of Security</b>	
Chapter Ten .....	192
Sino-Indian Strategic Competition and the New Scramble for the Indian Ocean	
<i>David Brewster</i>	
Chapter Eleven .....	208
Crisis amidst Abundance: Food Security in Bangladesh	
<i>Asif Siddiqui, Amzad Hossain and Dora Marinova</i>	
Chapter Twelve .....	229
Securing Space for Hospitality in a Settler-colonial City	
<i>Robyn Creagh, Thor Kerr, Shaphan Cox and Patricia Ryder</i>	

## CHAPTER EIGHT

# APPLYING A SUSTAINABLE DEVELOPMENT MODEL TO INFORMAL SETTLEMENTS IN ADDIS ABABA

ZAFU TEFERI, PETER NEWMAN  
AND ANNIE MATAN

The Indian Ocean region is facing unprecedented urbanisation. According to the United Nations Department of Economic and Social Affairs' Population Division,<sup>1</sup> cities in Asia are predicted to be home to more than 54 percent of the world's urban dwellers by 2050. The cities in Africa, whilst predicted to accommodate less than 25 percent of the world's urban dwellers by 2050, are growing rapidly. Informal housing is a feature of the cities in developing countries around the Indian Ocean Rim, and for many people these informal settlements are the first step towards a new life. By 2030 it is estimated that about two billion people will live in slums, primarily in Africa and Asia.<sup>2</sup> These urban areas have many physical problems, particularly the lack of adequate housing, sanitation and access to clean water. They are often, however, still preferred to living in rural areas due to the opportunities provided in the city. In these rapidly growing urban settlements, whole communities can develop, evolving their own economies, community life and social capital.<sup>3</sup> How to upgrade the physical environments of these informal settlements without damaging the existing economic, social

and community life of these places is an ongoing policy debate.<sup>4</sup>

This chapter examines the utilization of sustainable technologies or frameworks focused on increasing the liveability of informal settlements in an urban slum in Addis Ababa, Ethiopia. The chapter tries to resolve the ongoing issue of how to manage the physical, economic and social development needs of these areas using a sustainable development framework. The chapter first provides the context of the slum in Addis Ababa then discusses a sustainability framework developed from Newman and Kenworthy's Extended Metabolism Model alongside the United Nations' Sustainable Development Goals.<sup>5</sup> Then, application of the Extended Metabolism Model to a slum development in Indonesia is described and reflected on in the development of a sustainability model that enables analysis of these sites along with an integrated approach to policy-making. It is then argued that this model could be applied to other similar sites throughout the Indian Ocean Region.

### **Background to Slums in Ethiopia**

Slums are becoming an inevitable phenomenon of urban fabric in the developing world. An estimated five billion of the world's 8.1 billion people will live in cities by 2030.<sup>6</sup> Though it is an undeniable fact that urbanisation is an integral part of development processes and brings in opportunities and new potentials, there are acute and complex problems facing residents in informal settlements.<sup>7</sup> Slums are mainly characterised by a lack of access to safe water and sanitation, poor quality housing, overcrowded living environments and insecure tenure status.<sup>8</sup> Increasing urban poverty and income inequality, rapid rural to urban migration and lack of affordable housing contribute to the creation and proliferation of slums.<sup>9</sup>

Accommodating 30 percent of the urban population of Ethiopia, Addis Ababa, the capital of Ethiopia and the diplomatic centre of Africa, is one of the fastest growing cities on the continent. Like many cities in the developing world, Addis Ababa has experienced a rapid rate of urban growth in recent times. The population of the city increased from 0.44 million to 2.93 million between 1961 and 2010. The growth rate of Addis Ababa is expected to continue at a rate of 2.1 percent during 2011-2025 with the total population of the city expected to increase to four million in 2025. About two-thirds of the city residents are living in slums, with an approximate 28 percent of residents in Addis Ababa engaged in life below the minimum threshold (poverty line) in terms of both calorie intake and cost of basic needs in relation to their housing situation. While Addis Ababa offers many opportunities for residents to benefit from education, health and social services to improve their health and quality of life, its urban slums are creating economic, social and environmental problems that must be addressed.

The fast rate of urbanisation without corresponding expansion in basic services creates pressure that is manifested in poverty and unemployment. The social consequence of such rapid growth has been alarming. In one of Addis Ababa's oldest slums, Addis-Ketema, approximately 270,000 people share just over seven square kilometres. Here, 28 percent of people live below the poverty line, 45 percent of residents have no access to public health care, fifty-three percent have "informal" employment, 80% live in a single room house and there is a severe lack of access to water and sanitation.<sup>10</sup> The majority of housing is fifty years old and in bad condition despite being government-owned; people still find themselves in poor living conditions, forced to make-do with what resources are locally available to tend to repairs. Similarly, while 80 percent of residents have access to

electricity, it is unreliable, inadequate and often comes from local “power-brokers” who charge a higher fee than the government. While there are many pressing issues facing the population of Addis-Ketema, it is important to note that it is a place of great human energy and community spirit and home to many hard-working and inventive residents.<sup>11</sup>

In Ethiopia, the impact of inadequate sanitation and poor hygienic conditions are the biggest cause of deaths in children under five, due to related disease (such as malnutrition, diarrhoea, endemic cholera and respiratory infections).<sup>12</sup> Practical actions to improve the standard of living in informal settlements are clearly needed. Cities across the world are increasingly attempting to improve conditions in urban slums and some have implemented adaptive and proactive approaches to this complex issue.<sup>13</sup> Government efforts in Addis Ababa have focussed on urban renewal, which involves total demolition and rebuilding of houses, as well as eco-city planning from the principles of living with the environment and upgrading physical, social, economic and environmental aspects of the city. However, these approaches have achieved little. This chapter will outline an alternate approach being currently undertaken to determine how to upgrade the slums of Addis Ababa, utilising the Extended Metabolism Model to analyse the area and then integrate the approach to policy-making.

### **Sustainable Development Model**

Sustainable development is an approach created through global negotiation to enable development that facilitates economic productivity and wealth, ensures social equity and social capital is maintained or improved while reducing environmental footprints.<sup>14</sup> The next global step in this journey will be the application of the United Nations’ post-

2015 goals, known as the Sustainable Development Goals (SDGs).<sup>15</sup> These goals are listed in Table 8.1.

Sustainable Development Goals
Goal 1 No Poverty: End poverty in all its forms.
Goal 2 Zero Hunger: End hunger, achieve food security and improved nutrition and promote sustainable agriculture.
Goal 3 Good Health and Well-Being: Ensure healthy lives and promote well-being for all.
Goal 4 Quality Education: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.
Goal 5 Gender Equality: Achieve gender equality and empower all women and girls.
Goal 6 Clean Water and Sanitation: Ensure availability and sustainable management of water and sanitation for all.
Goal 7 Affordable and Clean Energy: Ensure access to affordable, reliable, sustainable and modern energy for all.
Goal 8 Decent Work and Economic Growth: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.
Goal 9 Industry, Innovation and Infrastructure: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.
Goal 10 Reduced Inequalities: Reduce inequality within and among countries.
Goal 11 Sustainable Cities and Communities: Make cities and human settlements inclusive, safe, resilient and sustainable.
Goal 12 Responsible Consumption and Production: Ensure sustainable consumption and production patterns.
Goal 13 Climate Action: Take urgent action to combat climate change and its impacts.
Goal 14 Life Below Water: Conserve and sustainably use the oceans, seas and marine resources for sustainable development.
Goal 15 Life on Land: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss.
Goal 16 Peace, Justice and Strong Institutions: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.
Goals 17 Partnerships for the Goals: Strengthen the means of implementation and revitalise the global partnership for sustainable development.

**Table 8.1. Sustainable Development Goals.**

A research project being undertaken at the Curtin University Sustainability Policy (CUSP) Institute is investigating how a Sustainable Development Goals framework might enable the remediation of slum housing. All of the SDGs have some potential to be applied to this set of issues in Indian Ocean Region slums. This project explores case study data from present and improved slum settlements in Addis Ababa and the application of the SDGs to slum housing, looking at the economic, social and environmental aspects of slums and assessing how they can be integrated into a set of policies.

The broad range of the SDGs can enable a more holistic approach in policy formation if looked at from a universal, integrated outlook. The goals can inspire policy-makers to make better, more inclusive and creative planning decisions by providing a holistic, internationally recognised platform. Creating better policies for management of slums and better planning to avoid the formation of slum conditions is touched on in most of the SDGs, for example, aside from the cities specific goal (goal 11), goals 1 and 3 relate to ending poverty and creating healthy lives for all. This, in extension, is integral to reducing inequality (goal 10) and to improving sanitation and access to water for all (goal 6). In addition, building strong policy foundations and recommendations help promote strong institutions along with a peaceful, inclusive and sustainable society (goal 16). These all relate to policy-making and slum upgrading decisions.

Slums are associated with poverty, poor living conditions and a lack of basic services. In both social and economic terms slums are underperforming and are representations of the world's inequalities. The rapid pace of urbanisation, especially of unplanned, informal settlements, has a large environmental footprint and while people are attracted to the opportunities associated with the city, often the city offers



little but struggle for slum dwellers. Previously, remediation attempts have often simply focused on engineering solutions such as upgrading the structure of houses or gentrification resulting in displacement of the population rather than actually remediating the living conditions of slums for their inhabitants.<sup>16</sup> This research looks at the conditions in slums and by applying the SDGs in the policy framework it hopefully ensures sustainability is integrated into the fabric of the policy practice.

The recommendations will be based on the results of two case studies of current and remediated slums in Addis Ababa and a review of the best global practices and lessons learned in slum improvement approaches. As a guide to evaluating the ability of the Sustainable Development Goals to provide an integrated framework model, the Extended Metabolism Model<sup>17</sup> has been used. This model has been applied previously to integrate economic, social and environmental goals in slum upgrading in Indonesia.

### **Extended Metabolism Model for Analysing Sustainable Development in Slums**

Newman and Kenworthy developed a model for assessing sustainable development in cities they called the Extended Metabolism Model.<sup>18</sup> This model, set out in Figure 8.1, demonstrates how many of the SDGs can be integrated into an assessment of how effective different approaches are for upgrading slums. Its application to the slums of Addis Ababa will be outlined as a framework for the data collection necessary for effectively upgrading these settlements consistent with the SDGs. The model demonstrates how the metabolism of a city is related to the throughput of resources and their inevitable flow on into wastes as they are consumed and used to create liveability. The list of resources, wastes and liveability can be expanded and focussed into a series of

indicators as suggested by Newman and Kenworthy.<sup>19</sup> These are outlined in Figure 8.1.

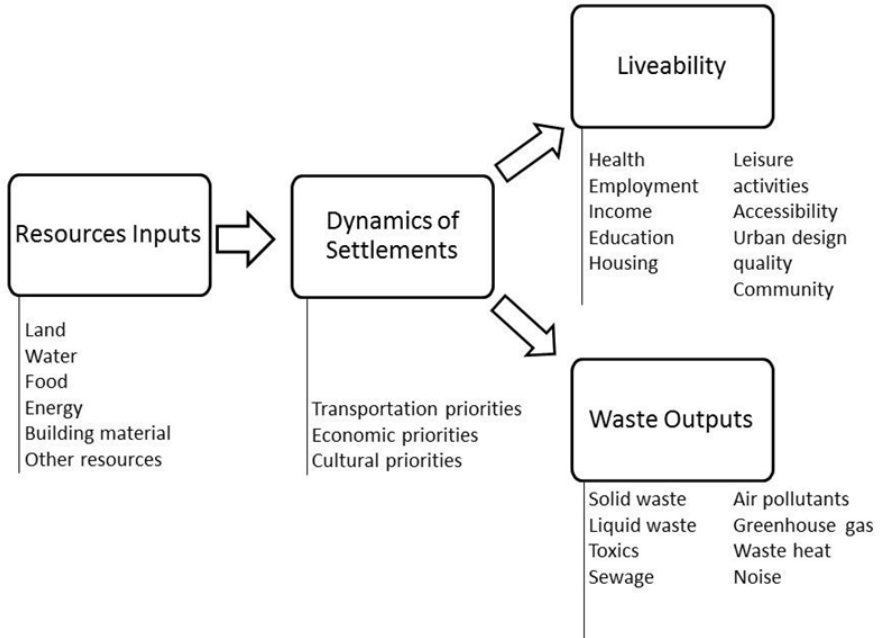


Figure 8.1. Indonesian slum dwellers and the Extended Metabolism Model.<sup>20</sup>

This model was used as a framework in a study of slum dwellers living along the Ciliwung River in Jakarta by Alma Arief, who surveyed the residents of this area and compared them to residents of a nearby high-rise apartment block who had previously been slum dwellers but were moved out into a modern high rise complex.<sup>21</sup> Arief asked whether the shifting of squatters was more sustainable in terms of their impact on the environment, their economic opportunities and their community health. The indicators surveyed by Arief along with the results of the study are set out in three tables (Tables 8.2, 8.3 and 8.4).

<b>Inputs</b>	<b>Ciliwung riverbank squatters</b>	<b>High rise apartments dwellers</b>
1. Water	248 litre/household/day	188 litre/household/day
2. Energy		
-Electricity	2.30 MJ/household/day	1.20MJ/household/day
-Kerosene	60.80 MJ/household/day	57.00 MJ/household/day
-Charcoal	0.90 MJ/household/day	0.15 MJ/day
-Gasoline	3.99 MJ/household/day	7.05 MJ/day
-Diesel	3.27 MJ/household/day	2.35 MJ/day
Total	71.26 MJ/household/day	67.75 MJ/household/day
3. Land	4.57 m <sup>2</sup> /person	0.91 m <sup>2</sup> /person
4. Building material	Bricks, wood and bamboo frame with tiles or tin roofs (very poor quality)	Bricks, ceramic floors tile roofs (good quality)
5. Food	Inadequate protection	More balanced but minimal intake

**Table 8.2 Summary of resource inputs to the two settlements.**

<b>Waste outputs</b>	<b>Ciliwung riverbank squatters</b>	<b>High rise apartments dwellers</b>
1. Solid waste	2.16/kg/household/day (82 percent solid waste in to Ciliwung)	1.66 kg/household/day (100 percent solid waste collected)
2. Liquid waste	248 litre/household/day (directly in to Ciliwung)	188 litre/household/day

3. Air waste (CO2	626 g CO2	326 g CO2
-Electricity	4,487 g CO2	4,206 g CO2
- Kerosene	85 g CO2	14 g CO2
-Charcoal	284 g CO2	502 g CO2
-Gasoline	241 g CO2	173 g CO2
-Diesel	5,723 g CO2	5,221 g CO2
Total		

**Table 8.3 Summary of waste outputs from the two settlements.**

Unit of Analysis	Ciliwung riverbank squatter	High rise apartment
1. Health	- Environmental health situation very poor. - 42 were ill in three month period	- Environmental health situation relatively good. - 34 were ill in three month period
2. Employment	- 55 percent street traders - 19 percent employed in private business - 0 percent home industries - Mostly participate in informal economy	- 6 percent street traders - 40 percent employed in private business - 2 percent freelance workers - Mostly participate in informal economy
3. Income (average)	- Rp 151,000	- Rp 252, 000
4. Housing	- Poor quality - 82 percent want to move to a different, better quality house	- Relatively good quality - Assumed do not want to move to a different house
5. Education	- 94 percent primary school and below	- 44 percent primary school and below

<p>6. Community</p>	<ul style="list-style-type: none"> <li>- High level of community</li> <li>- 92 percent knew &gt; 20 percent by first name</li> <li>- 90 percent happy to live there</li> <li>- 100 percent trust neighbours</li> <li>- 100 percent felt secure</li> <li>- 100 percent borrow tools</li> <li>- 100 percent borrow money from neighbours</li> </ul>	<ul style="list-style-type: none"> <li>- Low level of community</li> <li>- 44 percent knew &gt;20 percent by first name</li> <li>- 76 percent happy to live there</li> <li>- 52 percent trust neighbours</li> <li>- 4 percent felt secure</li> <li>- 70 percent borrow tools</li> <li>- 22 percent borrow money from neighbours</li> </ul>
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**Table 8.4. Liveability of Ciliwung Riverbank Squatter Settlement and high-rise apartment settlement.**

In this study, Arief found that the apartment dwellers used a little less energy and water than the slum dwellers and that their waste management was considerably better, particularly since the slum dwellers put all waste directly into the river.<sup>22</sup> In human terms, the apartment dwellers had improved incomes and employment (they were better able to enter the formal economy) and had similar levels of accessibility and health compared to those that lived in the slum; but in terms of community parameters, the slum development was far superior because the layout of housing encouraged people to know and trust their neighbours. Over 80 percent of people were able to trust their neighbours and lend them things while this was less than 20 percent in the high rise development. The lack of community orientation in the high-rise design questions the fundamentals of its development ethos. Arief points to alternatives like the Kampung Improvement Scheme that is a more organic way of rebuilding slums using the community structure in the area.<sup>23</sup> It is possible to see from these results how at least seven goals of the SDG are integrated into this assessment study in Indonesian slums and although most were positive, the community-based goals are not being achieved.

## **Application of the Extended Metabolism Model to Slums of Addis Ababa**

Using the Extended Metabolism Model for the study of the slum in Addis Ababa, the service facilities will be evaluated in terms of: dwelling place, source of drinking water, sewerage system, electrification, latrine facilities, drainage system, garbage disposal and access to health facilities. Findings from this analysis will enable the development of a policy framework to improve slum settlements in developing countries. Table 8.5 provides the set of parameters and questions that were developed as a basis for data collection.

<b>Questions that were developed as basis of data collection</b>
What rights do you have over the land?
Did you do any improvement to whatever was on the land when you settled here?
How often does the dwelling unit get maintained since your occupancy?
If the City Authority wants to renew your neighbourhood, and relocation becomes necessary, would you be willing to relocate?
Do you feel satisfied in this settlement?
Do you want to move to another settlement?
How do you classify the condition of a house you had in old neighbourhood/places?
If the government offered you to move to another settlement (like the settlement at Senga Tera), will you accept this offer?
Since you settled in this village, what changes have happened to your quality of life?

**Table 8.5. Questions that were developed as the basis for data collection.**

### **Findings of Sustainability of Addis Ababa Slums**

The focus of the research is to provide policy recommendations for better practice and outcomes in remediating and preventing slums. Rather than focusing on a single solution such as simply upgrading house structure and displacing the families that may no longer be able to afford to stay, the research aims to develop a holistic policy framework that works for sustainable transformation of slums into liveable, healthy urban areas. People-centred urban development is at the core of the research, and it is not difficult to see that this means that displacement is not a viable and sustainable solution, as it was not in Indonesia despite improvements to

the physical environment. The residents in the slum studied in Addis Ababa appear unwilling to move away from their tight knit community as it is a very old slum (Figure 8.2). Solutions and policies must aim towards transforming slums by taking into consideration not just the physical environment but life quality, health, access to water and sanitation along with opportunities for income-generation and most of all community<sup>24</sup>.



Figure 8.2. Older slum settlement of Addis Ababa, Ethiopia.<sup>25</sup>

Table 8.6 outlines the findings from field research looking at the Arat Kilo slum settlement and the Ginfle high rise condominium development in Addis Ababa. Primary data was collected from the residents of Arat Kilo slum settlement and Ginfle condominium apartments which housed residents relocated from Arat Kilo slums. Questionnaires were administered to these inhabitants to understand their perspectives and perceptions regarding the condition of the settlements based on the basic principles of SDG's. In addition, personal observations were recorded assessing the environmental condition of the settlements.

<b>Parameters</b>	<b>Arat Kilo slum settlement</b>	<b>Ginfe high rise condominium</b>
Resource Consumption and Environmental Footprint	<ul style="list-style-type: none"> <li>- 60 percent solid waste collected</li> <li>- 210 litre liquid waste/household/day</li> <li>(65 percent release waste water directly to river)</li> <li>- 22 percent use fuel wood</li> <li>- 30 percent use kerosene</li> <li>- 37 percent use electricity</li> <li>- Environmental health very poor</li> </ul>	<ul style="list-style-type: none"> <li>- 90 percent solid waste collected</li> <li>- 175 litre liquid waste /household/day</li> <li>- 3 percent use fuel wood</li> <li>- 10 percent use kerosene</li> <li>- 80 percent use electricity</li> <li>- Environmental health relatively good</li> </ul>
Liveability - Economic	<ul style="list-style-type: none"> <li>- 30 percent employed in private, government, and NGOs</li> <li>- 30 percent self-employed (informal activities)</li> <li>- 29 percent unemployed</li> <li>- 3 percent pensioners</li> <li>- Average income Br10,560</li> </ul>	<ul style="list-style-type: none"> <li>- 45 percent employed in private, government and NGOs</li> <li>- 43 percent self-employed (informal activities)</li> <li>- 7 percent unemployed</li> <li>- 5 percent pensioners</li> <li>- Average income Br17,600</li> </ul>
Liveability - Housing	<ul style="list-style-type: none"> <li>- Constructed from wood and mud</li> <li>- Cooking and sleeping take place in the same room</li> <li>- 70 percent owned by government</li> <li>- No bathroom</li> <li>- Pit latrines and communal electricity meters</li> <li>- 43 percent wish to live there with minor improvement</li> <li>- 30 percent need everything unchanged</li> </ul>	<ul style="list-style-type: none"> <li>- Houses are constructed from concrete blocks</li> <li>- Bed and kitchen rooms are separately available</li> <li>- 100 percent privately owned</li> <li>- Privately owned bathroom and electricity meters</li> </ul>
Liveability - Education	<ul style="list-style-type: none"> <li>- 67 percent primary school and below</li> </ul>	<ul style="list-style-type: none"> <li>- 30 percent primary school and below</li> </ul>
Liveability -	<ul style="list-style-type: none"> <li>- High level of community</li> </ul>	<ul style="list-style-type: none"> <li>- Low level of community</li> </ul>



Community	<ul style="list-style-type: none"> <li>- 80 percent happy to live there</li> <li>- 95 percent felt secure</li> <li>- 93 percent enjoyed access to at least one informal borrowing or lending network</li> <li>- 97 percent trust their neighbours</li> </ul>	<ul style="list-style-type: none"> <li>- 50 percent happy to live there</li> <li>- 60 percent have social tie with the previous communities</li> <li>- 7 percent felt secure</li> <li>- 42 percent enjoyed access to at least one informal borrowing or lending network</li> <li>- 34 percent trust their neighbours</li> </ul>
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**Table 8.6. Sustainability of Arat Kilo Slum Settlement and Ginfle High Rise Condominium.**<sup>26</sup>

In Arat Kilo only 60 percent of the solid waste was collected while the remaining 40 percent was dumped into the streets, river, and open space. In the condominium apartments, 90 percent of the solid waste was collected. Neither settlement had a practice of reuse, recycling or composting of wastes. In the slum settlement of Arat Kilo, 65 percent of liquid waste is released directly into the drainage lines and into the river.

The environmental surroundings of the Ginfle condominium were healthier than the environmental surroundings of the Arat Kilo slums. Therefore, a rise in the health status of the condominium residents could be expected. Diseases like tuberculosis, typhoid and diarrhoea, which are most of the time the result of either poor sanitation, poor living conditions or both, dictate the list of major health issues in the study area. These diseases account for more than three quarters of the incidences of disease in the slum settlement. The field research also reveals that the average income of the residents in the high rise apartments (Br17,600) was higher than that of the slum settlements (Br10,560). Even though the residents of the high rise apartments have almost twice the income of the slum settlements, most of high rise residents' income was spent on paying for their mortgages.

In the Arat Kilo slum settlement, homes were small and did not protect residents from the weather conditions. The condominium apartment residents had relief from this threat because the new houses could keep out cold temperatures, wind, rain and heat. Regarding the toilet, the condominium apartments were equipped with safe toilet facilities whereas the slums had pit latrines. All of the condominium residents had tap water

in their house or within a ten minute round-trip by foot. In the Arat Kilo slum, 60 percent of the households had tap water in their houses or were within walking distance from it. The remaining 33 percent of households had to travel further and queue up for long periods, while 7 percent of them fetched drinking water from rivers.

While 93 percent of the slum residents enjoyed access to at least one informal borrowing or lending network, only 40 percent of the condominium residents reported the same. More inhabitants of Arat Kilo than Genfle had met someone at a public place or coffee shop over the earlier month, received visitors at home, or paid a visit to someone else's home. Clearly, residents of the slum depend on family, neighbours and friends, interacting in enclaves of similar residents and enjoying a strong community life. Residents of the Genfle settlement are less aware of close neighbourly ties. This is such a strong emotion that despite the quality of their homes, they feel highly attached to their old areas of community life. People in the slums do not want to be relocated from their original place of residence regardless of their location in the future, though they do not want a better house. About 60 percent of the condominium residents have social ties with previous communities in the slum.

Generally, relocating people from slum areas is essential in providing better housing quality and a clean, healthy living environment where people are less prone to diseases resulting from poor sanitation. However, it has also been found that a large number of the studied communities have been directly affected by the loss of traditional institutional and social networks. Due to a loss of social cohesion, the condominium residents are more vulnerable to personal and economic shocks than the slum inhabitants.

### **Liveability and resource efficiency**

There is global concern about improving liveability whilst reducing resource use. Liveability is about access to essential services, such as health, clean water and sanitation, but it is also about a sense of community and belonging. The utilisation of the sustainability framework presented above, developed from Newman and Kenworthy's Extended Metabolism Model, has enabled the analysis and decision making around slum upgrades to go beyond purely physical development to include economic and social concerns.<sup>27</sup> The two examples presented, one in Indonesia and one in Ethiopia, illustrate how this framework can be used and how the SDGs could provide a guide for decision making. The utilisation of the Extended Metabolism Model helps facilitate the

integration of these goals. The results from Ethiopia mirror the results from Indonesia. A healthier and more formal settlement is clearly better on all the environmental and footprint factors and creates a more liveable place from the perspective of housing and economic development. However, the social aspects of new developments do not induce the same quality of trust and depth of social networking found in the traditional slum settlements. Even though the condominium high rise settlement is more liveable than the Arat Kilo slum settlement on the vast majority of parameters, the sense of community evident in the slum settlement is seen by residents as imperative for happiness and social cohesiveness. The approach outlined would enable integrated policy-making for slum upgrades which focus on quality of life, which can be applied to other areas with similar issues. In particular it suggests that much greater attention needs to be given to rehabilitating houses in situ, or to developing household designs that reflect the organic interactions of community life.

## Notes

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<sup>1</sup> United Nations, Department of Economic and Social Affairs, Population Division. 2015. *World Population Prospects: The 2015 Revision*. New York: United Nations.

<sup>2</sup> Evas, E. 2013. "Two Billion Slum Dwellers." *Forbes*. Accessed on September 26, 2013. [http://www.forbes.com/2007/06/11/third-world-slums-biz-cx\\_21cities\\_ee\\_011slums.html](http://www.forbes.com/2007/06/11/third-world-slums-biz-cx_21cities_ee_011slums.html).

<sup>3</sup> Carpenter J.P., A.G. Daniere, and L. M. Takahashi. 2004. "Cooperation, Trust, and Social Capital in Southeast Asian Urban Slums." *Journal of Economic Behavior and Organization* 55 (4): 533–551.

<sup>4</sup> Woolcock, M. 1998. "Social Capital and Economic Development: Toward a Theoretical Synthesis and Policy Framework." *Theory and Society* 27: 151–208.

<sup>5</sup> Newman P., and J. Kenworthy. 1999. *Sustainability and Cities*. Washington: Island Press.

<sup>6</sup> Majale, M. 2002. *Towards Pro-Poor Regulatory Guidelines for Urban Upgrading: Regulatory Guidelines for Urban Upgrading*. May 17–18. Bourton-On-Dunsmore.

<sup>7</sup> Hadush, E. 2011. *Factors Influencing Affected Group Participation in Urban Redevelopment in Addis Ababa: The Case of Senga Tera-Fird Bet I Project*. Rotterdam: The Netherlands.

<sup>8</sup> UN Habitat. 2003. *The Challenge of Slums; Global Report on Human Settlements 2003, United Nations Human Settlements Programme, 2003*. London: Earth Scan Publication Ltd.

<sup>9</sup> Ibid.

<sup>10</sup> Teferi, Z., and P. Newman. 2014. "Older Slums in Addis Ababa, Ethiopia: How do they work?" *Sixth International Conference on Responsive Urbanism in Informal Areas, UN Habitat and Cairo University*. November 25-28. 514-525.

<sup>11</sup> Ibid.

<sup>12</sup> Ethiopia Ministry of Health. 2011. *National Hygiene & Sanitation Strategic Action Plan for Rural, Peri-Urban & Informal Settlements in Ethiopia*. Addis Ababa. Also see RiPPLE. 2009. *Improving WASH Information for Better Service Delivery in Ethiopia: A Summary Working Paper under the Long-term Action Research Theme on Access to WASH services*. Addis Ababa.

<sup>13</sup> Coplák J and P. Rakšányi. 2003. *Planning Sustainable Settlements*. Bratislava: Slovak University of Technology.

<http://www.ecocity.szm.com/framework.html#overall>.

<sup>14</sup> Newman and Kenworthy, *Sustainability and Cities*.

<sup>15</sup> United Nations. 2015. Resolution adopted by the General Assembly on 25 September 2015, 17<sup>th</sup> session. Agenda Items 15 and 116. Accessed January 5, [http://www.un.org/ga/search/view\\_doc.asp?symbol=A/RES/70/1&Lang=E](http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E).

<sup>16</sup> Majale, *Towards Pro-Poor Regulatory Guidelines for Urban Upgrading: Regulatory Guidelines for Urban Upgrading*.

<sup>17</sup> Newman and Kenworthy, *Sustainability and Cities*.

<sup>18</sup> Ibid.

<sup>19</sup> Ibid.

<sup>20</sup> Ibid.

<sup>21</sup> Arief, A. 1998. "A Sustainability Assessment of Squatter Redevelopment in Jakarta." Master's Thesis, Murdoch University.

<sup>22</sup> Ibid.

<sup>23</sup> Silas, J. 1993. *Surabaya 1293-1993: A City of Partnership*. Municipal Government of Surabaya.

<sup>24</sup> See results in Teferi and Newman, 2014

<sup>25</sup> Authors's field survey. 2015.

<sup>26</sup> Author's field survey. 2015.

<sup>27</sup> Newman and Kenworthy, *Sustainability and Cities*.

#### **Publication 4**

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## Publication 4: Co-author statements

### To whom it may concern

I, Zafu Assefa Teferi, contribute 70% of the paper/publication entitled

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Zafu Assefa Teferi **(70% Contribution)**

Signature of candidate

Date 15.12.2017

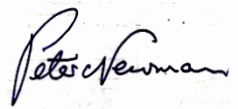


I, as co-author, endorse that this level of contribution by candidate indicated above is appropriate

Co-author 1 Prof. Peter Newman **(30% Contribution)**

Signature:

Date 15.12.2017



# **Improvement of Slums in Addis Ababa: Moving Towards Community-Sensitive Distributed Infrastructure**

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## **Abstract**

As a consequence of rapid urbanisation in a situation of economic and planning limitations, the larger part of urban inhabitants in low-income countries live in slums regularly characterised by a lack of essential services such as water, energy and sewerage. This paper seeks to compare the adequacy of services and environmental characteristics of informal slum settlements in Addis Ababa with high-rise slum clearance apartments, using empirical data collected from three existing informal slum settlements and two slum clearance apartment sites where slum dwellers had been relocated to these sites. The result reveals the informal slum communities are exposed to physical, socio-economic and health hazards because of poor quality housing, inadequate social services provision and poor environmental sanitation conditions. However, despite the apartment dwellers having better housing quality and a clean, healthy living environment where people are less prone to poor sanitation and inadequate energy, they have lost important community structures in the new buildings. This paper questions whether improving housing quality and infrastructure necessarily should destroy important community structures. It suggests that new, small-scale distributed infrastructure might help in ameliorating the present service challenges both in slums and apartment sites while maintaining the strength of the informal community life.

Keywords: slum, apartment, infrastructure, community, centralised and distributed

## **I. INTRODUCTION**

In the coming decades, urbanisation will continue to be the major trend, especially in sub-Saharan Africa and Asia, where the mainstream of extreme poverty is concentrated. In these and other parts of the world, cities will play a vital role in the ability of countries to attain sustainable development. According to the Sustainable Development Solutions Network (2013), half of the world's seven billion people live in urban areas. By 2030 there will be over one billion more urban inhabitants, and for the first time in many parts of the world, the number of rural population will start to decline. Between 2010 and 2050, the urban population will grow significantly, by 2.5 to 3 billion people, increasing the urban share to two-thirds of the world's population (UN HABITAT, 2013).

Global commitment to address inequality and poverty is articulated in the Sustainable Development Goals, one of which promises 'By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums' (UN, 2016). The global need is to improve the situation for 1 billion people or 30 percent of urban inhabitants, mostly in developing nations (UNDESA, 2015). African cities have a particular focus as in sub-Saharan Africa the proportion of slums is 55 percent; the highest of any continent. This estimate does not include the population who have inadequate housing or rent in unaffordable dwellings (Triveno, 2016).

Most cities in developing countries have not been able to expand the growth of their urban infrastructure and services at the rate required (Cities Alliance, 2015). According to Satterthwaite (1998), much of the population live in a settlement with little or no access to the infrastructure or services that are critical for the preservation of human health in an urban environment including piped and clean water supply, sanitation and drainage, regular garbage collection, healthcare and other social services.

Infrastructure provision in cities is generally managed using centralised systems in the modernist tradition. It is critical to acknowledge that many of these systems were developed using 19<sup>th</sup> century technologies that not only are now outdated and inefficient but were not originally designed to deal with the problems facing humankind in these days, such as climate change, and certainly are not appropriate for slum settlements where there is no space for the pipes and transmission lines. New small-scale technologies and processes for supplying and managing resources such as energy, water and waste at the neighbourhood level have been developed as part of the environmental technology systems approach to



address issues within a climate change context often in remote areas (OECD, 2011). Such technology systems are usually described as ‘distributed’ because they can be used *in situ* rather than being at the end of a large centralised system. These technologies are now being identified as top priorities for urban development and are increasingly targeted in the design of sustainable cities (Newman et al., 2017; Rauland, 2014). The modernist era of infrastructure provision is being replaced by more sustainable approaches (Newman, 2016). However such technologies are rarely seen as relevant to slum settlements which is the focus of this paper.

To achieve sustainability in slums, for example by implementing the Sustainable Development Goals, there is a need to recognise that this is not only to achieve physical improvements. Slum settlements have a need to address the economic and social needs of their residents as well as improving their housing quality and physical infrastructure. This paper attempts to examine the extent to which these social and physical issues can be integrated, and holistic solutions can be found. It suggests that a new model can be created that improves the health and economic prospects of slum residents without the standard approach of slum demolition and rebuilding in a high rise. It will examine whether new small-scale, distributed technology can assist slum improvement in situ and create a more community-sensitive distributed approach at the same time. It will use informal slums and slum clearance projects in Addis Ababa as the case study.

## **II. BACKGROUND**

### **a. Study context**

The city of Addis Ababa shares 30 percent of the country’s urban inhabitants with a population of around 4 million. About 120,000 new residents are added to the city every year. Most of this takes place in the slum areas where around 80 percent of Addis Ababa inhabitants’ live. Managing this issue is done either through forced evictions or demolition and transfer to new high- rise settlements. Forced evictions without any planned resettlement result in people becoming homeless in the city, often squatting at the outskirts of the city where there is little work or services available. Recently the city government of Addis Ababa has undertaken comprehensive slum clearance and urban renewal projects transferring people to high rise apartments on the urban fringe; there are plans for many more, and such policies are questioned in this paper.

Urban poverty is in a vicious cycle with poor housing conditions, and inadequate social and physical infrastructure. For example, if informal slum inhabitants in the city are forced to move to the periphery in an urban renewal project they can no longer access the places where they generate their income. If they also lose their social networks generated in the slum then they lose much of the informal support services so significant for their daily lives (Satterthwaite, 2004). However, the inadequacy or complete absence of basic infrastructure in slums presents a considerable public health risk (Corburn and Alice Sverdlik, 2017). Access to clean water and adequate sanitation has been a challenging issue for many years in these urban areas. Due to the unavailability of clean water sources and poor sanitation, most of the inhabitants of the slums are threatened by the spread of diseases such as diarrhoea and cholera; electricity supplies are also very unreliable as they generally depend on unsafe tapping from wires. To complete the picture the slums are generally informal, and therefore residents do not have easy access to the formal economy (Benjamin Marx et al., 2013).

There is no doubt that infrastructure in informal slums needs to be improved but the question is how best to do this. The research done for this paper examined centralised systems as in the new slum clearance high rise projects and also a decentralised approach to essential infrastructure through the use of distributed technologies, for example, small package treatment plants, or roof-top solar photovoltaics for renewable electricity provision. These have been available for many decades but have not been suitable as they were too expensive; due to mass production in places like China and India, they are now cheap. The possibility is therefore now available to examine whether small, flexible systems could be applied to small scale settlements, precinct by precinct, and could involve the community in their management as is now happening in many developed city demonstrations (Newman et al, 2017).

This paper will first lay out and compare the availability and adequacy of basic community and infrastructure facilities in existing informal slums in Addis Ababa and compare them to two slum clearance condominium projects. It will then outline a community-sensitive distributed infrastructure approach to the problems identified to suggest how this could be a better approach to upgrading the slums of Addis Ababa and similar slums in developing cities.

## **b. Theoretical context**

### **The history of slums and urban renewal**

The word ‘slum’ appeared for the first time in industrialising Europe and primarily was used to describe the cheap housing of lower-class workers (Roberts, 1971). Much of the 20<sup>th</sup> century modernist period of urban development has been about slum redevelopment which was generally called ‘urban renewal’ (Hall, 1988). Urban renewal projects based on slum clearance and high-rise towers set in large areas of open space with freeways was the model espoused by Le Corbusier from the 1920’s on. This occurred in developed cities from the 1940’s to the 1960s but was not considered successful (Mumford, 1961: Hall, 1988) and in the words of Christopher Klemek (2011) have ‘collapsed’ across the developed world as a way of making urban improvement. Jane Jacobs (1961) was able to show that the Le Corbusier modernist approach was socially damaging to the fine-grained community structures of the old, organic urban fabric and hence destroyed the local economy as well as its walkability. Slum clearance was then replaced by urban regeneration based on the fabric of the urban area being restored and given better infrastructure. The basic approach has been to improve infrastructure and to allow market forces to improve housing due to their locational advantages. Some social housing is usually added (World Bank, 2006). Although high-rise has continued to be built, the majority of old slums in Europe, America and Australia have been regenerated using a model that respects the urban fabric and is community-sensitive (Thomson, Newton and Newman, 2016).

However modernist urban renewal has continued as the dominant model in emerging economies. One reason for this has been that emerging economy cities have had extremely rapid growth from the 1960s (Richard and Engelman, 1997). Thus pressure to clean up their slums began immediately (Hoskins, 1970). Despite the failure of urban renewal projects in the developed world, there has been a continuing history of slum clearance and forced resettlement into high rise buildings in emerging cities (d’ Cruz and Satterthwaite, 2005). As slums are mainly characterised by a lack of access to potable water and safe sanitation, poor quality housing, overcrowded living environments and insecure tenure status (Wagstaff, 2002), the issues are likely to be more usefully addressed if they are handled *in situ* as in the developed world (Berger, 1978). However, the major approach to slums in developing cities remains through slum clearance for high-rise (UN-Habitat 2006).

### **Causes and characteristics of slums**

Although inadequate affordable housing is a feature of most cities, it is a principal problem in the developing world (World Bank 2012). There is a vast literature showing different reasons for the causes of these slum settlements (UN-HABITAT, 2003; Hari, 2006; Jerome, 1990). However, it is mostly due to the rapid growth of these cities.

Slums grow when the pace of urbanisation overtakes governments' capability to deliver the framework for affordable housing, for example, infrastructure, land and access to utilities, for the rapidly increasing population (Lucci et al., 2015). Urbanisation is not easily slowed or stopped as it is associated with economic opportunity. Christ (2016) has shown that slum settlements emerged in North American and Western European cities as a consequence of industrialisation. The recent formation of slum settlements in developing countries has also resulted from people migrating in large numbers from rural areas and other small towns into big cities that are now the source of industrial production and new economic opportunity (Wagstaff, 2002; Weinstein, 2014).

Informal slum settlements are thus characterised by rapid, unstructured, unplanned development (Ambaye, 2011). Slums are habitually the first stopping points for poor migrants that provide low-cost affordable housing in the absence of concerted effort by public agencies to create housing for the poor. Their meagre savings are used to build basic shelters for themselves in empty areas. One of the physical attributes of slums is an absence of possession of the land where they are residing. Usually, they make their houses in vacant government or private land or marginal land areas like railway setbacks, river edges, steep or swampy land (Unger and Riley 2007). Most of all, these settlements lack acceptable infrastructure for provision of energy, water and waste as these are largely provided by informal tapping of power and water and local, unsanitary waste disposal. However, they are the sites of urban communities that rapidly develop their own social capital, local economies and history (McQuarrie, 2013).

### **c. Recent slum programs in Ethiopia**

In most cities and certainly in Ethiopia's cultural setup, housing is not considered as a shelter only, but also as an asset, a means of social security and indicator of social status (UN-Habitat, 2007). However, housing in Ethiopia was dominantly owned by a few groups of elites for the duration of the first half of the 20<sup>th</sup>-century. Low-income households had little option for their own legal recognition as slum housing was not recognised as formal by governments (UN-HABITAT, 2011).

However, in terms of government recognition, this has now changed though there is little change to the physical condition of the slums. Based on the UN-Habitat 2011 definition, 80 percent of Addis Ababa is a slum with 70 percent of this containing public owned rental housing. The majority of Addis Ababa's low-income population resides in rental public housing. However, such houses are generally bad quality, usually constructed of wood, mud and discarded materials. They are usually old with little or no maintenance and have poor infrastructure (Adamu, 2015).

Urban renewal through slum clearance and provision of a highrise on a large scale, as a main instrument of urban development policy, is a somewhat recent occurrence in Addis Ababa. The Filwuha Area Resettlement projects and the Tekle Haimanot upgrading are instances of early urban renewal in Addis Ababa. The recent redevelopment projects are associated with private development of Dembel City Centre, Sheraton Hotel, Eri Bekentu, and Casanchis Renewal Projects (Addis Ababa Chamber of Commerce, 2011).

Efforts to reduce urban slums through upgrading rather than urban renewal have been limited. One small slum upgrading programme, managed by the Office of Environmental Development (OED), was conducted in 1994 based on small-scale infrastructure improvement but it was not continued as it was donor funded (UN-HABITAT, 2007). Upgrading programs remain small for informal slums but could be the basis for a more mainstreamed urban regeneration approach if accepted by the communities and provided with the necessary infrastructure (Ministry of Urban Development, Housing and Construction, 2014).

The government, however, has formulated an ambitious vision for low-income urban and housing development, articulated as the Integrated Housing Development Programme (IHDP). It needs all slums to be removed within ten years as the requirement for Ethiopia becoming a middle-income country by 2025 (UN Habitat, 2011). This is a highly visionary goal but is it the right approach to providing slum upgrading?

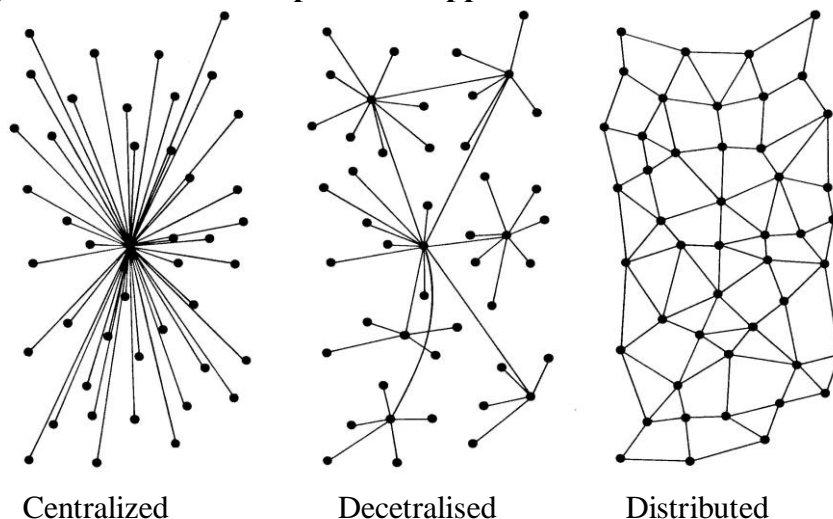
#### **d. Rethinking failed approaches of slum improvements**

Relocations destroy people's traditional lives. Once people are forced to move away from an area where they have lived and perhaps worked for many years, their social networks are destroyed (Abebe and Hesselberg, 2013). Awareness of this has grown within western aid agencies (Abu-Ghazzeh, 1999). The approach favoured by such organisations today is organic upgrading and improvement, with the objective of integrating low-income communities into their larger urban fabrics. However, this is not clearly on the agenda of governments in such areas as there is no solution to the problems of basic infrastructure services. The dense organic structures are seen to be highly unhealthy and dangerous. So how do we provide infrastructure for such intensive urban developments where there is so little space between buildings?

#### **f. Centralised, decentralised and distributed infrastructure systems**

There are three approaches to infrastructure provision as set out in Figure 1.

**Figure 1. Infrastructure provision approaches**



Source: Baran, 1964

Centralised systems of water, energy, sewerage and sanitation services are under review in most cities of the developed world; such modernist systems are no longer as effective and efficient in a resource-constrained world and have little or no community-sensitivity (Newman, 2009; 2016). The potential to use less centralised infrastructure systems in low-income countries (Chocat, 2002) that can offer better prospects for local stakeholder inclusion in planning and decision-making, and for utilisation of the resource at the local level (Parkinson and Tayler, 2003) has been acknowledged but little consideration has been given to how it could be used in slums.

Distributed infrastructure has many advantages over traditional provision for slums. Firstly, the initial investment required is considerably less and can be slowly developed across the whole settlement in small stages. The physical equipment can be transferred to another slum without loss to the value of the equipment (Schaengold, 2006). Such distributed infrastructure is small scale thus basic maintenance and even bill collection can be performed, with proper instruction, by community members who are themselves beneficiaries of the service. Such management can be assisted with simple smart technologies that are available through readily available communication systems – this is now called ‘smart slums’ (McQuilan, 2014).

According to Newman et al. (2017), the cost of providing the infrastructure necessary for distributed power, water, and waste systems is relatively superior to centralised systems. For example, in Hopetoun, a remote settlement in Western Australia, a mining company and the state government had to assess how best to build the town's infrastructure to support a large inflow of people for a new mining project. They assessed three options: centralised, distributed, and decentralised. The results showed the distributed option was half the cost of the others and would save \$0.5 billion. However, the utilities were not keen to do it as they were not familiar with the approach (Williams in Newman et al., 2017).

Decentralised systems are made up of many independent systems and products that can link with each other if necessary as a network. Distributed structures have no centre and do not have to rely on a centre for their being operational. All the intersection points in a distributed system are linked to each other. Centralised systems have a greater risk of one event breaking the entire system. However, if one of the systems in a decentralised or distributed system breaks, it is more likely that only one element is lost, not the whole system (Markville Council, 2012; Parkinson and Tayler, 2003). Perhaps of greatest significance, distributed

infrastructure enables organic urban regeneration where the social networks of the urban area can be preserved or even enhanced.

The focus of this study is on whether the small scale (neighbourhood level) distributed infrastructure is appropriate for water, energy, solid waste and sanitation in Ethiopian slums. In particular, the extent of the social networks and whether they are important for sustainable development will be assessed along with the need for better infrastructure.

### **III. Research Study**

#### **a. Methodology**

Empirical data were collected from three informal slum settlements and two slum clearance high-rise apartments located nearby to the slums in Addis Ababa. The purpose of this research was to compare and assess the adequacy and availability of service infrastructure, and the quality of the community and living environment of the slum communities and the apartment inhabitants. Thus the study seeks to gain an understanding of the physical lifestyles and social networks in the slums and to develop an innovative and practical framework that harnesses people's needs for settlement improvement to achieve more sustainable development.

Mixed research methods, such as a questionnaire survey of slum households, interviews and participant observations, were used in this study. The study adopted purposive sampling to approach the problem with a specific plan of selecting predefined groups of slum areas in the city. The slums were selected based on two geographical locations (inner area and periphery) and the age of the settlements (old and new). Questionnaires were distributed to 250 selected households to acquire information on the sort of toilet facility used, the means of waste disposal and sanitation, the primary source of water and access to energy as well as questions that enable community quality to be assessed. Observation was another technique used to collect data using a checklist of issues to be observed.

#### **b. Research location and description**

##### **Arat Kilo (Arada)**

This informal slum is a socially mixed residential place, where formal and informal structures coincide. Diverse typologies, ranging from single detached house, and cluster housing to poor dwellings can be found. Additionally, the age, construction quality, and infrastructural provisions of the buildings vary but are overall substandard.



### **Taliyan Sefer (Addis Ketema)**

This informal slum is part of the old city centre and is dominated by a combination of deteriorating residential dwellings and commercial activities. It comprises the biggest market place of the country, Merkato, and the express bus port. Within Addis Ketema, Taliyan Sefer is one of the most densely populated areas with approximately 700 inhabitants per hectare.

### **Tora Bora (Akaki Kality)**

This study area is located on the periphery of Addis Ababa city and contains both types of informal and formal residential areas. Most of the land used by this informal slum was originally set aside for agricultural purposes.

### **Ginifle (Arada)**

This is a slum clearance high-rise apartment in Arada sub city, which is located in the inner city of Addis Ababa, just located a short walking distance from the Arat Kilo slum. Most of the people living here were former residents of Arat Kilo.

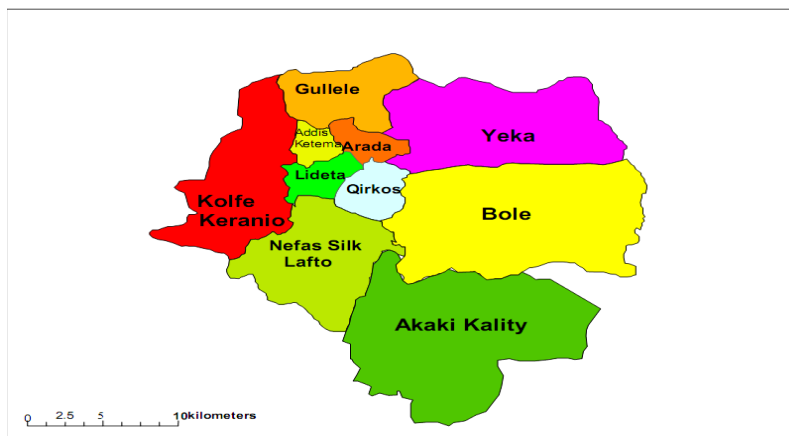
### **Yeka-Ayat (Yeka)**

The slum clearance Yeka-Ayat high-rise apartments are situated in the Yeka Sub-city administration located in the Eastern part of Addis Ababa periphery. It is a new set of dwellings and most residents were slum dwellers that came from different parts of the city.

**Table 1. Selected sub-cities and settlements showing geographical locations**

Sub City	Settlement Name	Geographical Location
Addis Ketema	Taliyan Sefer	
Arada	Arat Kilo	Inner city old slums
	Ginifle	Inner city high-rise apartments
Akaki Kaliti	Tora Bora	Newly formed slums at periphery
Yeka	Yeka Ayat	High-rise apartments at periphery

**Figure 2. Addis Ababa by Sub-cities**



Source: Addis Ababa Planning and Information Office, 2015

## IV. FINDINGS

### a. Overview of socio-economic situation

The data collected on all the slum inhabitants show that people came to the city from different parts of the country, and they migrated due to a range of social, economic and environmental reasons, such as drought in rural areas and better living conditions in the city. The majority of them are engaged in activities in the informal sector which enable them to eke out their living. The central business district has provided the most sought after socio-economic environment for the sort of casual, unofficial activities and businesses that they depend on. These slum residents are engaged in a variety of employment usually in small trading activities along the dusty pathways, such as the sale of cooked food, charcoal, second-hand clothes, vegetables and grains, as well as timber products; these are the main sources of income to the communities in the slums. More formal temporary jobs are also taken, such as the provision of security, construction and cleaning for middle and high-income residents in the city.

**Figure 3. Informal trading in slums**



Source: Survey, 2016

### **Size of household**

The number of people in the families of the interviewees from the slum settlements varied from 1 to 12, while the number of families of respondents in the high-rise apartments ranged from 1 to 7. The number of individuals in a household still living in the three slum settlements is bigger than the number of people in families at the high-rise apartments. People living in the slums who had more than four members in their household is 66 percent on

average, while in the apartments it is only 46 percent. Table 3 shows the size of families of the five settlements.

**Table 2. Household size of respondents**

Number of people in the household	Taliyan Sefer (%)	Arat Kilo (%)	Tora Bora (%)	Ginfle (%)	Yeka -Ayat (%)
<2	7	6	4	19	21
3 - 4	24	15	18	32	35
5 - 6	49	50	46	33	30
7 - 8	14	20	17	14	13
>8	6	9	5	2	2
Total	100	100	100	100	100

Source: Survey data, 2016

### Housing conditions

According to the Population and Housing Census of Ethiopia (2007), housing conditions of most Ethiopian urban areas are generally of poor quality. Countrywide more than 80 percent of the housing dwellings were built from impermanent building materials that cannot sustain their structure for more than two years; urban areas account for 27 percent of these, while 60 percent are built of more permanent materials. Most of the slum houses in this survey are similar in structure and are mainly single-room dwellings; these dwellings are built in such a way that there is almost no space between them. In this type of housing, a single room acts as a bedroom, sitting room, store and so on. Five persons and in some situations more than five may share a single room.

**Figure 4. Housing conditions in slums of Addis Ababa**



Source: Survey Data, 2016

## b. Physical infrastructure

### Solid waste collection

Table 5 shows that only 29 percent of the households of slum inhabitants had access to designated waste dumping areas, in some settlements, waste disposal is poorly disposed of since they are located on marginal lands such as swamps. As a result the adjacent major water sources of most urban areas are contaminated. Only a very small number of people have a rubbish bin (38 percent) while the rest did not even have that (62 percent). The proportion of people who own a rubbish bin in the slum clearance units is 86 percent, while of the remaining 14 percent did not have a rubbish bin. Unlike the slum settlements, every block of the high-rise units has its rubbish collection point. Everyone seems to obey the directive requiring people to take all rubbish to a collection point, with or without a rubbish bin in the unit.

**Table 3. Solid waste collection and disposal methods**

<b>Waste collection method</b>	Taliyan Sefer (%)	Arat Kilo (%)	Tora Bora (%)	Ginfle condominium (%)	Ayat condominium (%)
Rubbish bin	37	46	32	82	90
Plastic bags	25	30	25	16	07
Open space	38	24	43	02	03
<b>Total</b>	100	100	100	100	100
<b>Disposal method</b>					
Collection point	27	31	30	93	97
Streams and open space	58	59	53	05	03
Burning	15	10	17	01	-
<b>Total</b>	100	100	100	100	100

Source: Survey data, 2016

Among the three informal slum settlements, Arat Kilo had relatively the cleanest environment regarding littering and solid waste distribution but in general solid waste is a problem in these areas. Solid waste management at the urban renewal apartments is fairly good with minimal waste observable. In Addis Ababa, solid waste is usually collected directly from its source and transported by handcarts to a rubbish collection point and then taken to open waste dumping sites on the outskirts of the city. In the informal slum settlements the alley-ways are too narrow for hand carts to enter so the rubbish collectors are unable to collect the solid wastes. Hence they build up in various areas or are pushed into watercourses.

## Access to sanitation

**Table 4. Latrine types of the interviewed household**

Toilet facilities	Taliyan Sefer (%)	Arat Kilo (%)	Tora Bora (%)	Ginfe condominium (%)	Ayat condominium (%)
Pit latrines	65	72	83	95	98
Septic tank	30	21	17	05	02
Flash toilet	05	07	-	100	100
<b>Total</b>	100	100	100	100	100

Source: Survey data, 2016

The general level of sanitation at Ginfe and Yeka-Ayat apartment sites was far better than that which pertained at the three informal slum settlements. Most of the sanitation facilities were traditional pit latrines shared between two and amongst ten households. From the researcher's observations, some of these facilities were dirty and hardly functional. Inhabitants who lacked, or had unhygienic sanitation facilities within their dwellings, used flying toilets, someone's latrines, and a few used communal latrines. Satterthwaite (2016) states that the quality of provision for sanitation should not be evaluated only by household facilities but at a neighbourhood or a precinct level to determine whether faecal matter is being disposed and managed adequately or is contaminating water systems. This needs further research but pollution of ground water appears to be happening as there is little happening to prevent it. Few parts of the city are served by the 110 km sewer network, which constitutes only 4 percent of the total system needed by the city (Daniel, 2010).

## Source of water supply

Infectious diseases, especially water-related, are prevalent in many of the settlements of Addis Ababa. Results from the informal slum settlements reveal that only 20 percent of the households have access to piped water. Those who do not have their own tap have access to shared pipes and public water pipes. 71 percent of households responded that they have good access to the public water taps. Most public water taps are privately owned, and access to public water taps are paid for (76 percent).

**Table 5. Sources of water supply**

Source of water supply	Taliyan Sefer (%)	Arat Kilo (%)	Tora Bora (%)	Ginfle (%)	Yeka Ayat (%)
Own pipe	7	6	8	91	88
Water vendors	74	75	84	2	3
Private wells	2	3	2	0	0
Water tankers	0	5	0	7	8
Other sources	6	11	6	0	1
Total	100	100	100	100	100

Source: Survey Data, 2016

Around 90 per cent of slum clearance high rise residents have their own water tap. Water access in the upper levels (4<sup>th</sup> level) of the apartment sites is intermittent due to the low water pressure provided by the pump, which is worsened by the frequently interrupting electricity system. The residents on the lower floors had better access to water and often offered or sold water to their upstairs neighbours. According to the district housing manager, selling water from the taps is technically not allowed because it is only the responsibility of the government to sell water, but the local council would not interfere with this practice because of the large water shortage problem.

### Sources of energy

Most people in the apartments have access to electricity, and in the informal slums, there are a variety of energy sources, especially charcoal for cooking. The proportion of those who used firewood for cooking and heating was highest at Tora Bora due to the proximity of the village to the sources of firewood supply (at the fringes of Addis Ababa). On average, only 12 percent of the surveyed households in the informal settlements had access to electricity. Kerosene is not extensively used in cooking but is important as an energy source for lighting.

**Table 6. Sources of energy for cooking**

Source of energy	Taliyan Sefer (%)	Arat Kilo (%)	Tora Bora (%)	Ginfle condominium (%)	Ayat condominium (%)
Electricity	12	19	7	66	73
Firewood	15	7	35	2	3
Charcoal	70	73	55	27	12
Kerosene	3	1	3	5	2
Total	100	100	100	100	100

Source: Survey Data, 2016

In the absence of modern energy services, the urban poor rely on illegally obtained electricity, kerosene and candles for lighting. They use kerosene and traditional biomass including charcoal, firewood, coal, dung and straw for cooking and heating purposes. Studies have shown that compared to wealthier households, the poorest 20 percent of households spend a higher proportion of their incomes on these lower quality fuels which cause harmful indoor air pollution (Hardoy, Mitlin and Satterthwaite, 2001). The combustion of low quality solid and non-solid fuels for cooking and heating is the largest contributor to indoor air pollution on a global basis.

### c. Community quality

Unlike in developed countries, where people living in slums often do not have a sense of integration and solidarity (Berger, 1978; McQuarrie, 2013), the sense of solidarity and integration among Addis Ababa slum inhabitants is very high; they are often safe and active hives of activity. The results are shown in Table 9. Ninety percent of the slum residents enjoyed access to at least one informal borrowing or lending network. More inhabitants of the settlement had met someone at a civic place or coffee shop over the earlier month and or were visited by someone at home or paid a visit to somebody else’s home. Clearly, residents of the slum depend on family, neighbours and friends.

On the other hand, those residents of the slum clearance high rise are unhappy with their community quality. The high-rise apartment residents are extremely dissatisfied with their ability to have financial help from neighbours, and the level of trust is very low. Social capital can be destroyed when forced interventions impose new social relations without taking into account the strengths of the old. The current relocation program can be seen as forced as it does not let the high-rise apartment inhabitants choose where to live (Abebe and Hesselberg, 2013).

**Table 7. Summary of community quality of slums and high-rise apartments**

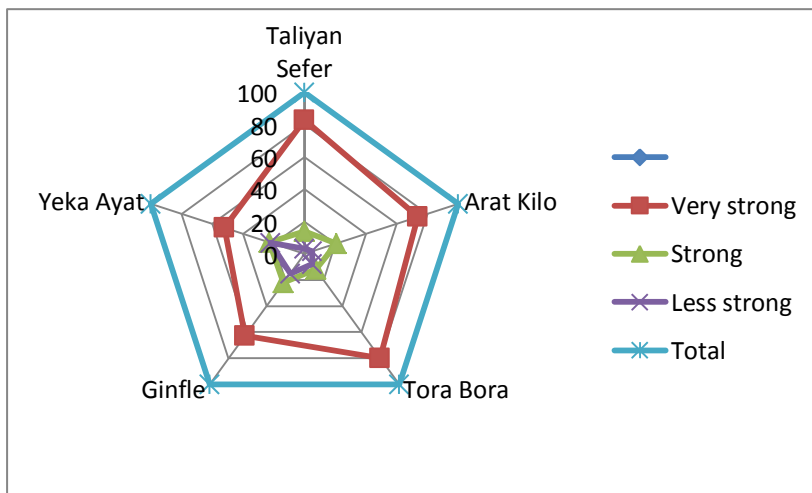
Community indicators	Taliyan Sefer (%)	Arat Kilo (%)	Tora Bora (%)	Ginfle condominium (%)	Ayat condominium (%)
Happiness	83	74	91	63	52
Security	87	74	91	65	55
Financial help	85	81	91	25	32
Trust	91	83	87	54	43

Source: Survey Data, 2016

The majority (86 percent) of the slum settlement said that it is very common to ask help from their neighbours. They all said that when they are in an emergency situation such as having a shortage of money, they felt comfortable to ask their neighbour for a loan. It is also common to borrow appliances from them. Similarly, only 27 percent of the apartment inhabitants received help from their neighbours.

Regarding security, 83 percent of respondents in the informal slums replied that the slum area is more secure while 48 percent of condominium dwellers felt they were more secure.

Figure 3 below shows that over 80 per cent of the informal slum residents believe they have a very strong community while only 40 percent of the apartment residents feel that. It is clear that the apartment’s community is no longer having the same quality of social networks. Some people in the apartment units still do not know the person who lives next door. They suggest the community is more self-oriented now and is low on civic awareness. The apartment residents were quite keen to preserve such community quality back in their former slum settlement though none want to return due to the benefits of the physical environment.



**Figure 5. Community cohesion and solidarity**

## V. CONCLUSION

This study has demonstrated that Addis Ababa, like many large emerging cities, is not dealing with its slums in a way that can adequately demonstrate both physical and social benefits. There are ways that high-rise slum clearance housing can better engage its residents to enable the community quality to be maintained after they are moved. Bay (2004) has shown how Singapore works to ensure community quality is enabled and how high rise



design can better provide common area facilities. However, it ought to be possible to also upgrade the informal slums *in situ*. It is suggested that a less modernist approach where everything is cleaned up using standard high-rise buildings, could be shifted to a more organic renewal of the slums themselves where infrastructure for energy, water and waste can be brought in. This approach is likely to build on the community structure of the settlement rather than destroy it as has happened in the slum clearance high-rise approach. The use of community-sensitive infrastructure has characterised slum urban developments for thousands of years as they have shaped our cities through organic renewal and rebuilding. The distributed infrastructure approach might help in ameliorating the present service challenges both in slums and high-rise apartment sites.

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### **References**

1. Abebe G and Hesselberg, J (2013), “Implications of Urban Development-Induced Resettlement on Poor Households in Addis Ababa”, *Ghana Journal of Geography* Vol. 5, 19 pages.
2. Abu-Ghazze, T. M. (1999), “Housing Layout, Social Interaction, and the Place of Contact in Abu-Nuseir, Jordan” *Journal of Environmental Psychology* XIX, pages 41–73.
3. Adamu, W (2015), The challenges and Opportunities of Slum Upgrading in Addis Ababa: The case of Arada Sub city, Addis Ababa Master thesis, Addis Ababa University, Ethiopia, 74 pages.
4. Addis Ababa Chamber of Commerce and Sectoral Associations (2011), Assessment of Urban Development practices on Business Expansion in Ethiopia, 139 pages.
5. Ambaye DW (2022), “Informal Settlement in Ethiopia, the Case of Two Kebeles in Bahir Dar City” TS06 D- Informal Settlement Issues, Spatial Development, Planning and Governance (ed) Bridging the Gap between Cultures, 27 pages, Accessed on 3 May 2015 at [https://www.fig.net/resources/proceedings/fig\\_proceedings/fig2011/papers/ts06d/ts06d\\_ambaye\\_5096.pdf](https://www.fig.net/resources/proceedings/fig_proceedings/fig2011/papers/ts06d/ts06d_ambaye_5096.pdf)
6. Baran, P (1964), On Distributed Communications, Introduction to Distributed Communication Networks, Rand Corporation, 51 pages, accessed on 12 March 2016 at [http://www.rand.org/content/dam/rand/pubs/research\\_memoranda/2006/RM3420.pdf](http://www.rand.org/content/dam/rand/pubs/research_memoranda/2006/RM3420.pdf)
7. Bay, P. (2004), “Sustainable community and environment in tropical Singapore high-rise housing: the case of Bedok Court condominium” *ARQ: Architectural Research Quarterly*, 8(3/4), 333-343.

8. Benjamin Marx, Thomas Stoker, and Tavneet Suri (2013), "The Economics of Slums in the Developing World", *Journal of Economic Perspectives* Volume 27, 187–210, Pages 187–210 accessed on 13 March 2017 at <http://hci.stanford.edu/courses/cs379l/2014/Urban-Slums.pdf>
9. Berger, A.S (1978), *The city: Urban Communities and Their Problems*, C..Brown Company Publishers, Iowa, 511 Pages.
10. Celine d’Cruz and David Satterthwaite (2005), "Building homes, changing official approaches: The work of Urban Poor Organizations and their Federations and their contributions to meeting the Millennium Development Goals in urban areas", *Poverty Reduction in Urban Areas Series, Working Paper 16*, IIED, London, 84 pages, accessed on 2 September 2016 at <http://pubs.iied.org/pdfs/9547IIED.pdf>
11. Chocat, B (2002), "Sustainable Management of Water in Cities. Valencia", *Universidad Internacional Menendez Pelayo*, 21 pages, accessed on 7 June 2015 at <http://www.petus.eu.com/graphics/FRsusmanagecitiesBC.pdf>
12. Corburn, J and Sverdlik, A (2017), "Slum Upgrading and Health Equity" *International Journal of Environmental Research and Public Health*, 14(4), 342, 12 pages.
13. Daniel A, (2010), "Urban Environmental Challenges in Developing Cities: The Case of Ethiopian Capital Addis Ababa", *International Journal of Environmental, Chemical, Ecological, Geological and Geophysical Engineering* Vol 4, No, pages 1-6, accessed 14 July 2016 at <http://waset.org/publications/12541/urban-environmental-challenges-in-developing-cities-the-case-of-ethiopian-capital-addis-ababa>
14. Hall, P (1988), *Cities of Tomorrow: An Intellectual History of Urban Planning and Design in the Twentieth Century*, Basil Blackwell, Oxford, 640 pages.
15. Hardoy, E Mitlin, D, Satterthwaite, D (2011), *Environmental Problems in an Urbanizing World: Finding Solutions in Cities in Africa, Asia and Latin America*, 2nd Edition, Routledge, 464 pages.
16. Hehl, R. and Stollman, J (2010), *New Towns for the 21st Century: the Planned vs. the Unplanned City: New-Town-To-Be: Kotebe Hana Mariam*, SUN Architecture, Amsterdam, 245 pages.
17. Hoskins, W.G. (1970), *The Making of the English Landscape*, Penguin Books, London.
18. Jacobs, J (1961), *The Death and Life of Great American Cities*, New York: Random House, 458 pages.
19. Jerome, F, (1990), *Human Geography: Landscape of Human Activities (2nd ed.,)*, USA, WCB Publishers, 512 pages.
20. Jones B (2012), 'Bankable Slums': the global politics of slum upgrading, *Third World* .
21. Keare, D. H. and Parris, S. (1992,) "Evaluation of Shelter Programs for the Urban Poor: Principal Findings", *World Bank Staff Working Papers number 547* Washington, DC, The World Bank, 132 pages.
22. Klemek, C (2011), *The Transatlantic Collapse of Urban Renewal, Postwar Urbanism from New York to Berlin*. Chicago: Univ. of Chicago Press, 328 pages.
23. Lucci, P (2015), "What Works in Improving the Living Conditions of Slum Dwellers", *A review of evidence across four programmes*, Overseas Development Institute, London, 40 pages.
24. Markville Council (2012), *Strategy for a Water Sensitive Community 2012 – 2021*, Sydney, 46 pages.
25. McQuillan, D (2014), 'Smart Slums: Utopian or Dystopian Vision of the Future?' *The Guardian* 6 October 2014, accessed on 11 June 2017 at <https://www.theguardian.com/global-development-professionals-network/2014/oct/06/smart-slums-smart-city-kenya-mapping>

26. Ministry of Urban Development, Housing and Construction, (2014), National Report on Housing & Sustainable Urban Development, 75 pages.
27. Mukhija V (2001), "Enabling Slum Redevelopment in Mumbai: Policy Paradox in Practice" *Housing Studies*, 16:6, 791-806, DOI: 10.1080/02673030120090548, accessed on 4 April 2016 at <http://dx.doi.org/10.1080/02673030120090548>
28. Mumford, Lewis (1961), *The City in History: Its Origins and Transformations and Its Prospects*. New York: Harcourt Inc, San Diego, New York, 637 pages.
29. Newman et al, (2017), *Resilient Cities, Second Edition: Overcoming Fossil Fuel Dependence*, Island Press, Washington DC, USA, 264 pages.
30. Newman P, (2016), "Sustainable urbanization: four stages of infrastructure planning and progress" *Journal of Sustainable Urbanization, Planning and Progress*, Vol. No 1: Pages 3–10 accessed 23 April 2017 at <http://dx.doi.org/10.18063/JSUPP.2016.01.005>.
31. Newman, P, (2009), Planning and Sustainable Urban Development: Linking the Green and Brown Agendas, in UN Global Review of Human Settlements-2008, United Nations Habitat, Nairobi, 338 pages.
32. OECD (2011), *Invention and Transfer of Environmental Technologies, OECD Studies on Environmental Innovation*, OECD Publishing, 237 pages, accessed on 12 May 2016 at <http://dx.doi.org/10.1787/9789264115620-en>
33. Parkinson, J and Tayler, K (2003), "Decentralized Wastewater Management in Peri-Urban Areas in Low-Income Countries", *Environment and Urbanization* 15, pages 75-90, accessed: on 15 September 2016 at <http://journals.sagepub.com/doi/abs/10.1177/095624780301500119>
34. Private Sector Development Hub/Addis Ababa Chamber of Commerce and Sectoral Associations (2011), *Situation Analysis of Business and Sectoral Associations in Ethiopia*.
35. Rauland V (2013), Decarbonising Cities: Certifying Carbon Reduction in Urban Development, PhD Thesis, Curtin University, 330 pages.
36. Richard P and Engelman, R (1997), *Economics and Rapid Change: The Influence of Population Growth*, Population Action International, 30 pages accessed on December 30 2016 at [http://pai.org/wp-content/uploads/2012/01/Economics\\_and\\_Rapid\\_Change\\_PDF.pdf](http://pai.org/wp-content/uploads/2012/01/Economics_and_Rapid_Change_PDF.pdf)
37. Roberts, R (1971), *The Classic Slum: Salford Life in the First Quarter of the Century*, Manchester, Manchester University Press, 266 pages.
38. Satterthwaite D (2004), "The Under-estimation of Urban Poverty in Low and Middle-income Nations", Poverty Reduction in Urban Areas" Series Working Paper 14, IIED London, 75 pages, accessed on 15 November 2016 at <http://pubs.iied.org/pdfs/9322IIED.pdf>
39. Satterthwaite D (2016), "Missing the Millennium Development Goal targets for water and sanitation in urban areas", *Journal of environment and Urbanization*, IIED, Vol 28(1): 99–118. DOI: 10.1177/0956247816628435, Pages 99-118.
40. Satterthwaite, David (1998), "Cities and sustainable development: what progress since Our Common Future?"
41. Schaengold D (2006), Clean Distributed Generation for Slum Electrification: The Case of Mumbai, Discussion paper, Woodrow Wilson School Task Force on Energy for Sustainable Development, Princeton, pages 1 – 24.
42. Sustainable Development Solutions Network (2013), "Why the World needs an Urban Sustainable Development Goal", 6 pages, accessed on 23 January 2017 at <http://unsdsn.org/wp-content/uploads/2014/02/130918-SDSN-Why-the-World-Needs-an-Urban-SDG-rev-1310291.pdf>

43. The World Bank (2012), Action Plan for Moving Slum Upgrading to Scale: UNDP-World Bank Water and Sanitation Program - South Asia, New Delhi, India, 23 pages, accessed 23 April 2017 at <http://web.mit.edu/urbanupgrading/sponsor/ActionPlan.pdf>
44. Thomson G, Newton P and Newman P (2016), "Urban Regeneration and Urban Fabrics in Australian Cities", *Journal of Urban Regeneration and Renewal* Vol. 10, No 2, pages 169 – 190 accessed 18 April 2017 at <http://www.ingentaconnect.com/content/hsp/jurr/2017/00000010/00000002/art00007?crawler=true&mimetype=application/pdf>
45. Triveno, L, (2016), Eight Stubborn Facts about Housing Policies, The World Bank, accessed on 14 May 2016 at <http://blogs.worldbank.org/sustainablecities/psd/category/tags/slums>
46. UN HABITAT, (2006), *State of the World's Report 2006/7*, Earthscan, United Nations Human Settlements Programme, Nairobi, Kenya, 108 pages.
47. UN HABITAT, (2011), *Condominium Housing in Ethiopia: The Integrated Housing Development Programme*, Nairobi, Kenya, 64 pages.
48. UN HABITAT, (2013), "State of the world's cities 2012/2013: Prosperity of cities", Routledge, 152 pages.
49. Unger, A., & L. W. Riley (2007), "Slum Health: From Understanding to Action." *Plos Med.*, 4(10), 1561-1566 accessed on 16 September 2016 at <http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.0040295>
50. UN-HABITAT (2007), *Situation Analysis of Informal Settlements in Addis Ababa, Cities without Slums Programme: Addis Ababa Slum Upgrading Programme*. United Nations Human Settlements Programme: Nairobi, Kenya, 93 pages.
51. UN-Habitat, (2003), *The Challenge of Slums: Global Report on Human Settlements*, Nairobi United Nations Human Settlements Programme, 345 pages.
52. United Nations (2016), *The Sustainable Development Goals Report*, New York, USA.
53. United Nations, Department of Economic and Social Affairs, Population Division (2014), *World Urbanization Prospects: The 2014 Revision, Highlights* (ST/ESA/SER.A/352), New York, 32 pages.
54. United Nations, Department of Economic and Social Affairs, Population Division (2015), "World Population Prospects: The 2015 Revision, Key Findings and Advance Tables" Working Paper No. ESA/P/WP.241, New York, 66 pages.
55. Wagstaff A (2002), "Poverty and health sector inequalities" *Bulletin of the world health organization.*;80(2): Pages 97-105.
56. Weinstein, L. (2014), *The durable slum—Dharavi and the right to stay put in globalizing Mumbai*.Hyderabad: Orient Blackswan, 210 pages.
57. Werlin, H (1999), "The Slum Upgrading Myth," *Urban Studies*, Vol. 36, No. 9, pages 9, 1523-1534.
58. Williams B (2008), "Hopetoun Infrastructure Study," Perth: Landcorp, WA Government, in in Newman et al, (2017), *Resilient Cities, Second Edition: Overcoming Fossil Fuel Dependence*, Island Press, Washington DC, USA, 264 pages.
59. World Bank (1993), "Housing Enabling Markets to Work" A World Bank Policy Paper, Washington, DC, 137 pages.
60. World Bank (2000), "Entering the 21st Century", *World Development Report 1999–2000*, Oxford University Press, Washington DC, 317 pages.
61. World Bank, (2006), *Thirty years of World Bank shelter lending: what have we learnt*, Washington DC, USA, 140 pages.

## Publication 5: Co-Author Statements

### To whom it may concern

I, Zafu Assefa Teferi, contribute **70%** of the paper/publication entitled

Teferi, Z. A., & Newman, P. (2018). Slum Upgrading: Can the 1.5° C Carbon Reduction Work with SDGs in these Settlements? *Urban Planning*, 3(2), 52-63.

(Zafu Assefa Teferi **(70% Contribution)**)

Signature of candidate

Date 15.12.2017



I, as co-author, endorse that this level of contribution by candidate indicated above is appropriate

Co-author Professor Peter Newman **(30% Contribution)**



Signature:

Date 15.12.2017

Article

## Slum Upgrading: Can the 1.5 °C Carbon Reduction Work with SDGs in these Settlements?

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### Abstract

The need to improve slum housing is a major urban planning agenda, especially in Africa and Asia. This article addresses whether it seems feasible to do this whilst helping achieve the 1.5 °C agenda, which requires zero carbon power along with enabling the Sustainable Development Goals. Survey data from Jakarta and Addis Ababa on the metabolism and liveability of slums are used to illustrate these issues. The article shows that this is possible due to advances in community-based distributed infrastructure that enable community structures to be retained whilst improving physical conditions. The urban planning implications are investigated to enable these ‘leapfrog’ technologies and a more inclusive approach to slums that enables in situ redevelopment instead of slum clearance, and which could be assisted through climate financing.

### Keywords

climate financing; informal settlements; metabolism; SDGs; slum redevelopment; urban planning; zero carbon

### Issue

This article is part of the issue “Urban Planning to Enable a 1.5 °C Scenario”, edited by Peter Newman (Curtin University, Australia), Aromar Revi (Indian Institute for Human Settlements, India) and Amir Bazaz (Indian Institute for Human Settlements, India).

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### 1. Introduction

The Paris Agreement unites all countries in a common cause to respond to and deal with the effects of global climate change. It offers support to developing countries to meet ambitious targets. At the same time as the Paris Agreement, the world has committed to the 17 Sustainable Development Goals (SDGs) which include a range of social and economic goals, especially about ending extreme poverty in an ‘inclusive’ way. This article seeks to understand how the poorest parts of the developing world, informal settlements, can participate in both of these agendas and how urban planning can assist. It examines these issues through presenting the results of research into slum communities in Jakarta, Indonesia, and Addis Ababa, Ethiopia.

The Paris Agreement sets a long-term temperature goal of holding the global average temperature increase

to well below 2 °C and pursuing efforts to limit this to 1.5 °C above pre-industrial levels (Tollin & Hamhaber, 2017). The Intergovernmental Panel on Climate Change is now seeking an agenda where 1.5 °C is seen as the primary focus and this must be achieved whilst enabling the SDGs. This agenda would see an acceleration of renewable energy both replacing old fossil fuel systems and providing new electric power where it has not been before; all the while this needs to happen while significantly improving the social and economic conditions of those consuming this electricity.

For informal settlements or slums, this will need to address the entire urban planning program for such settlements, including what kind of development strategy is preferred. This article compares two strategies with the fundamental question: should the settlements be cleared and replaced with modern high-rise housing linked to centralized renewable power or is it possible

to implement distributed renewable power whilst upgrading slums in situ? It will then examine whether the preferred strategy could be assisted using new participatory planning approaches and climate finance from the Paris Agreement.

## 2. Overview of Slums

Slums present a variety of social and environmental problems. The United Nations Human Settlements Programme (UN-Habitat, 2003) defines a slum household as a group of individuals living under the same roof in an urban area who lack one or more of the following five conditions:

- Durable housing of a permanent nature that protects against extreme climate conditions;
- Adequate living space, which means no more than three people sharing the same room;
- Easy access to safe water in sufficient amounts at an affordable price;
- Access to sufficient level of sanitation in the form of a private or public toilet shared by a reasonable number of people; and
- Security of tenure that prevents forced evictions.

However, all informal settlements do not have the same characteristics, nor do all slum residents suffer the same degree of deprivation, as some may meet only one of the conditions while others may have all five (Givens, 2015; UN-Habitat, 2006). Many rural residents of developing countries migrate to the cities in search of better employment in order to get a better quality of life for themselves and their families. Nevertheless, when they arrive, most are faced with the universal challenges of basic, crowded and poorly built shelter, and a lack of services such as power, water and sanitation facilities (MacPherson, 2013). Most immigrants expect to leave the slum areas shortly after earning enough to afford better housing; however, many do not move as they become structurally part of the informal sector and are unable to achieve more than low incomes (UN-Habitat, 2003). The ending of extreme poverty in the world (SDG1) will need to focus on slums in the developing world, especially Africa and Asia.

Addis Ababa, like many emerging cities, has a high level of informal settlements, perhaps up to 80% (Teferi & Newman, 2014; UNDESA, 2014). Indonesia also has a high (28%) level of informal settlement (Jones, 2017). The questions facing policy makers as explored in this article are how such slums in both areas can be upgraded in a way that achieves the 1.5 °C reductions in greenhouse gases whilst enabling economic and social goals to be achieved as set out in the SDGs (UN, 2016) and how urban planning can help with this agenda.

Two approaches seem to be prevailing with slum regeneration: one approach is urban renewal based on slum clearance and transfer to high-rise dwellings; the

other is urban regeneration based on in situ upgrading of infrastructure using solar energy and other community-based distributed infrastructure (Satterthwaite, 2004, 2016; Teferi & Newman, 2017; The World Bank, 2012; UN-Habitat, 2003). Data from three existing slums have been compared to two urban renewal high-rise complexes where residents were transferred from slums (Teferi & Newman, 2017).

This article explores whether it is possible to do zero carbon power cheaply whilst improving housing quality and improving social and economic opportunities rather than destroying important community structures. It examines the potential for new infrastructure to be distributed on a small scale, such as roof-top solar panels and batteries, allowing the strength of informal communities to be maintained. If possible, this could achieve the required carbon reductions for the 1.5 °C agenda as well as substantially achieving the SDGs. The role of urban planning is then outlined.

## 3. Background to SDGs

During the 2015 United Nations General Assembly, UN-member states approved the 2030 Agenda for Sustainable Development, a global development programme that lays out 17 SDGs to be achieved by 2030. The SDGs, which came into existence in 2016, are a collective set of goals, targets and indicators that set forth objectives with the social, economic, and environmental elements of sustainable development (UN, 2016). Solving acute sustainable development issues such as ending extreme poverty, reducing climate change, narrowing inequality and enabling ecosystem protection are the main focus.

The SDGs come into effect in a world that is continuously growing more and more urban. Urbanisation has some of the world's greatest development challenges, but it also has tremendous opportunities for advancing sustainable development. Now that the SDGs have been agreed upon, the real test of their success lies in their implementation.

The 11th Sustainable Development Goal is to make 'cities and human settlements inclusive, safe, resilient and sustainable'; the first target of the goal aims to ensure 'access for all to adequate, safe and affordable housing and basic services, and upgrade slums by 2030'. In 2000, the total slum population of the developing regions of the world was 760 million, which represented around 39% of the total urban population of those areas. The share of slum population to the total urban population of the developing regions came down to 32% by 2009, yet the total slum population increased to 863 million (UN-Habitat, 2013). Due to the interrelated nature of the SDGs, improving the slum dwellers' living conditions contributes to the achievement of many of the approved goals, such as:

- SDG 11: Make cities and human settlements inclusive, safe, resilient and sustainable;

- SDG 6: Ensure availability and sustainable management of water and sanitation for all;
- SDG 1: End poverty in all its forms everywhere; and
- SDG 7: Ensure access to affordable, reliable, sustainable and modern energy for all.

Therefore, the objective of this article is to illustrate how the 1.5 °C agenda can be achieved along with these SDGs.

#### 4. The Paris Agreement and the 1.5 °C Agenda

The 2015 Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC), aims to reduce the impacts of climate change on socioeconomic and ecological systems and amend current emissions rates to the lowest possible levels by designing an objective setting the rise in the global average temperature from pre-industrial levels to significantly less than 2 °C (IAEA, 2016; Rogelj et al., 2016; Wollenberg et al., 2016). In order to achieve this, countries have submitted Intended Nationally Determined Contributions (INDCs) outlining their post-2020 climate action. These INDCs solve a number of problems, which can relate to avoiding, adapting or coping with climate change, among other things. Nevertheless, targets and actions for reducing greenhouse gas (GHG) emissions are core components.

However, the 2 °C agenda of the Paris Agreement is not likely to be enough to reduce climate change to levels that would ease the dramatic increase in global impacts from cyclones, fire and floods as well as the entire loss of coral reefs from ocean warming, despite much scepticism about these issues (Diffenbaugh et al., 2017; Dunlap, 2013). Hence the IPCC has agreed to gather the research for a new agenda that would enable a mechanism to ratchet up the reduction of global greenhouse emissions in a way that ultimately leads to no more than 1.5 °C. It also has agreed to examine how this can be done whilst enabling the SDGs. This article attempts to assist with this agenda.

#### 5. Poverty and World Energy

Nearly 1.6 billion people of the world population had no access to basic electricity in 2014 (Bhatia & Angelou, 2015) and 1.1 billion of them live in developing countries, primarily in Sub-Saharan Africa and South Asia. They rely on inefficient biomass energies, such as wood, animal and crop waste for cooking and heating, which have harmful effects on health and air quality. Around 75% of the world's marketable energy is consumed in urban areas, and many of the poor who need access to improved energy systems are located in rapidly growing slums all over the developing world (GNESD, 2013). Despite such statistics, the energy requirements of poor urban households in the south have not been appropriately addressed as many programs have focussed on rural populations where no power exists (Siddiqui & Newman, 2005). These rural programs have usually

been successful as solar PV panels fit easily into village structures and governance (Baldwin, Brass, Carley, & MacLean, 2015; Casillas & Kammen, 2010; Nygaard, 2009; Urpelainen, 2014); this would suggest that similar approaches to slum electrification would work also but these programs are rare (Parikh, Chaturvedi, & George, 2012; Singh, Wang, Mendoza, & Ackom, 2015) suggesting that there may be more of an ideological issue among urban planners.

The greatest population growth is occurring in cities of developing countries; however the world cannot afford a simultaneous increase in the use of fossil fuels accompanied with this anticipated growth. If the world's poorest slum dwellers are to receive power, it must be from zero carbon renewable sources, such as solar power hence it is necessary to resolve this urban planning issue.

Currently, greater than half the world's population live in urban areas (UN-Habitat, 2016). By 2030, it is predicted that six in 10 people will be urban residents (UN-Habitat, 2016). Regardless of numerous planning challenges, urban areas provide more efficient economies of scale on various levels, comprising the provision of goods, services and transportation. With sound, risk-informed planning and management, cities can become incubators for innovation and growth and drivers of sustainable development. This will now need to apply to the provision of slum housing power which is renewable.

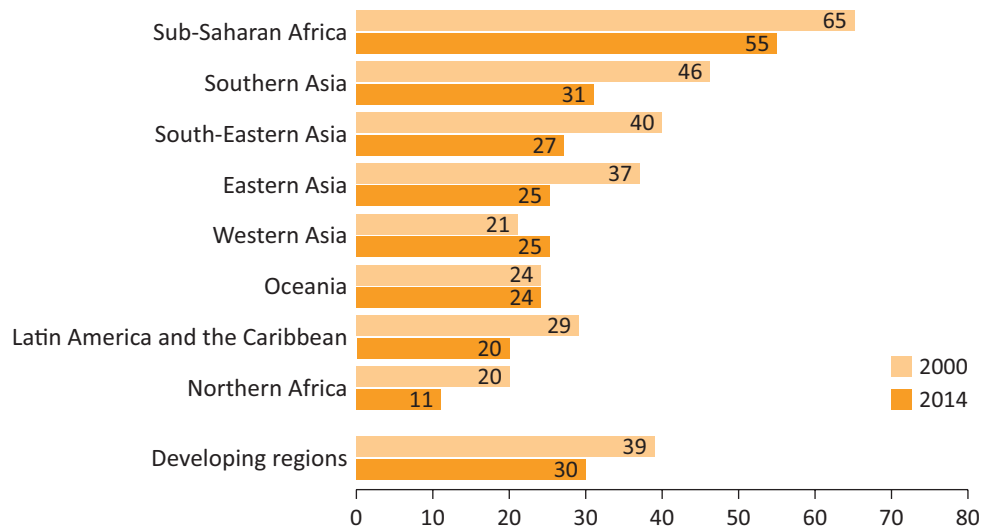
A study conducted in five slum settlements using serviced and non-serviced settlements in the state of Gujarat in India showed that energy provision improves productivity and enables slum dwellers to change their ambitions (Parikh et al., 2012). Interventions such as provision of basic services increase productivity and enable slum inhabitants to then emphasise higher level aspirations (Aklin, Bayer, Harish, & Urpelainen, 2015; Parikh et al., 2012). It also tends to be associated with creating formal tenure that unlocks the ability of householders to upgrade their own homes. This will need to apply to the provision of power to slum housing based on renewable energy. It is important for the quality of life of the slum-dwellers, and is a path towards further development (Schaengold, 2006). This article argues that not enough has been done on slum electrification in urban areas and needs to have more direction from urban planners and other decision makers.

#### 6. Global Slum Conditions and Approaches to Their Development

In 2014, 30% of the urban population in developing countries lived in conditions classified as slums (see Figure 1). In sub-Saharan Africa, the proportion was 55%—the highest of any region (UN-Habitat, 2016). Though the percentage of city inhabitants living in such circumstances reduced over the past decade, more than 880 million people all over the world were living in slums in 2014.

The upgrading of existing slums may seem to be at odds with global sustainability goals on resource con-





**Figure 1.** Proportion of urban population living in slums, in 2000 and 2014 (%). Source: UN-Habitat (2016).

sumption. Slum regeneration suggests using more natural construction materials, to build more, for more people, with occupants eventually using more to maintain and operate their houses than they currently do in slums. This would mean an increase in global GHGs for example. The problem, therefore, is to improve the living conditions of the urban poor in a way that does not negatively impact on the global and local environment, while at the same time improving local, regional, and national economies. There is evidence that this is happening as global GHG emissions are now decoupling from economic wealth generation, particularly in developed economies but also in emerging ones (Newman, 2017a, 2017b). Furthermore, in the long term, there is enormous potential for the greening of the housing sector of developing countries precisely because much of the urban housing stock is yet to be built, and this presents an enormous opportunity to build green today and make significant environmental and economic savings in the future (French & Lalande, 2013). Nevertheless, in developing countries, the challenge is not only to address the environmental impacts of the slums but to balance this with the economic, social, and cultural pillars of sustainable urban development (French & Lalande, 2013; UN-Habitat, 2013).

There appears to be two ways of approaching the development of slums in previous decades:

### 6.1. The Modernist Slum Clearance Method

Slum clearance was and is a policy reaction to the demands of those in need for decent housing, but its aim has rarely been to simply meet those demands. Slum clearance was meant to bring health and hygiene benefits; larger avenues were to accelerate transport and to ease crowd control and surveillance (Frenzel, 2016). In urban planning history, the modernism approach as set out in the Athens Charter by CIEE ‘clears the slate’ as suggested by Le Corbusier (Ley, 2014). The idea is to

start again using modern architecture, mainly high-rise housing (Newman, Beatley, & Boyer, 2017). Since this approach does not take in to consideration the social structure of the neighbourhoods it has been successful at providing good physical infrastructure and economic opportunities as it enables the residents to join the formal economy through achieving tenure, but the social and community benefits were challenged (Jacobs, 1961). Resettlement through relocation of households to distant places in the city can cause economic shocks and social disruptions of the poor (Burra, 1999; Yntiso, 2008). Those against relocation believe that resettlement detaches residents from their livelihoods and expose them to poverty (Takesada, Manatunge, & Herath, 2008; UN-Habitat, 2011;).

### 6.2. The Organic Slum Development Method

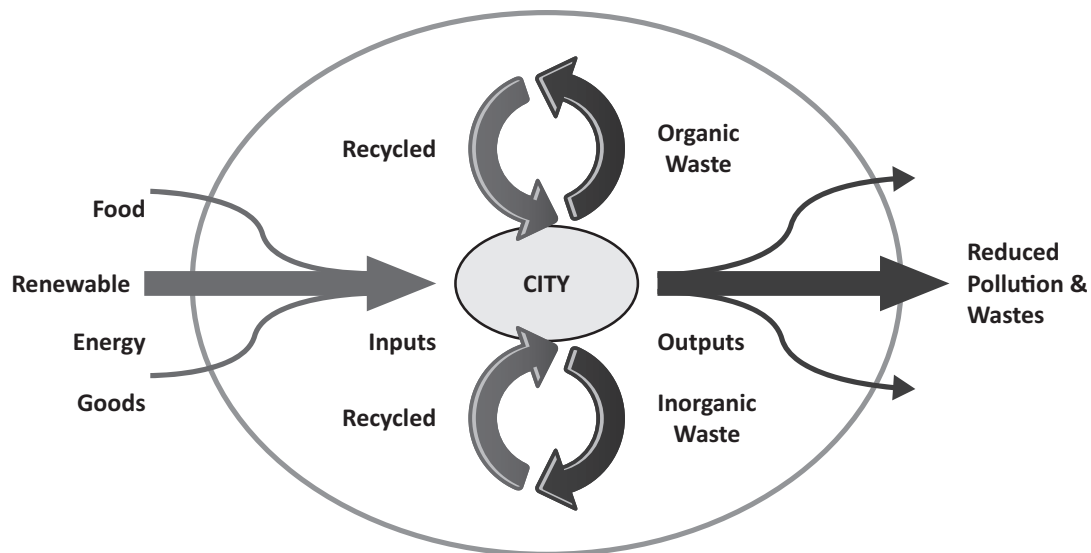
Modernist slum clearance and housing provision were also increasingly lamented by urbanites and a new generation of urban planners following Jane Jacobs (1961) and Turner (1976) who criticized the loss of traditional urban habitats and neighbourhoods in increasingly inhumane urban architecture (Frenzel, 2016). They suggested instead a more organic approach to improving slums. This approach develops slums in situ by providing the residents with formal tenure and enabling redevelopment of buildings and infrastructure by the community. Although this is more uncertain in its progress and outcomes it is designed to build on the social capital of the community rather than remove it. Jacobs (1961) was able to show that the Le Corbusier’s modernist approach was socially damaging to the fine-grained community structures of the old, organic urban fabric and hence destroyed the local economy as well as its walkability (Newman et al., 2017; Teferi & Newman, 2017).

Both approaches to slum development will need to manage the potential increase in the metabolism of housing (the consumption of resources including energy

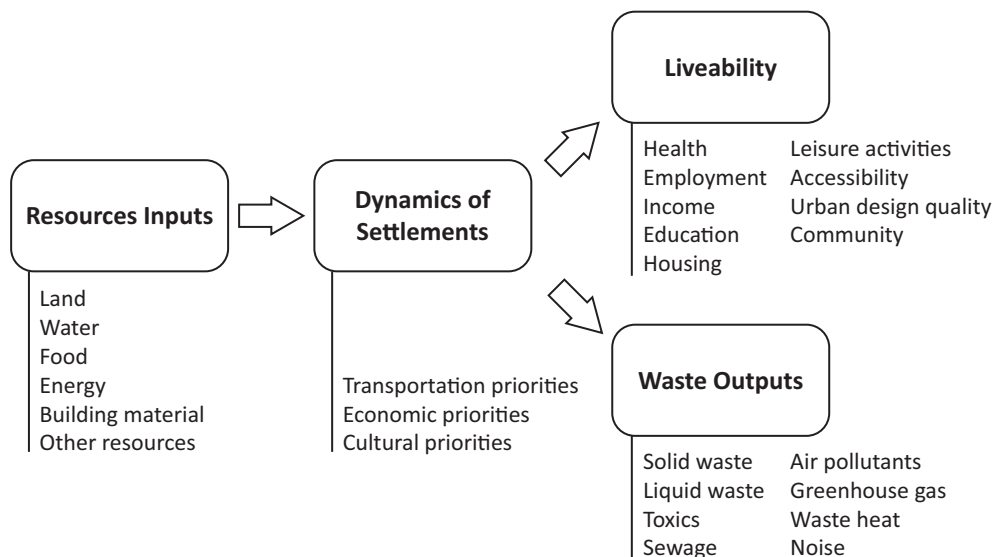
and the production of waste including GHGs) if it is to achieve the 1.5 °C agenda. Figure 2 is a schematic illustration of how a more circular metabolism will enable this to happen. However, it will also need to show how it can reduce its metabolism whilst improving liveability as set out in Figure 3.

Urban metabolism modelling provides a tool for understanding and monitoring the performance of urban structures not just in terms of GHG emissions but also as they relate to broader sustainability elements including water, waste, transport, and materials and all the elements of liveability in cities (Newman et al., 2017). As modelling of urban metabolism, along with a general understanding of urban systems improves, there is growing evidence that human settlements have large untapped sustainability potential. Not only may cities potentially

have no net impact, but they may even become regenerative, in terms of energy, water, food and biodiversity. Each of these elements needs an understanding of urban stocks and flows, which can be provided through an urban metabolism analysis (Newman et al., 2017). If the Extended Metabolism Model is used it has the potential to assist in understanding both the potential to create settlements that are zero carbon but also whether they are achieving the SDGs at the same time (United Nations, 2016). There does not seem to be a literature on the application of the Extended Metabolism Model to slum improvement apart from Arief (1998). The article sets out to examine whether the Extended Metabolism Model can throw light on the best approach to slum improvement as it lends itself to policy issues in urban planning for sustainability.



**Figure 2.** Circular metabolisms (Newman et al., 2017) adapted from Rodgers (1997).



**Figure 3.** The extended metabolism model (Newman & Kenworthy, 1999).

## 7. Background of the Study Areas

This article will examine a series of slums in Addis Ababa and Jakarta in order to compare their metabolism and liveability and thus the potential for achieving the 1.5 °C agenda with SDG improvements.

The city of Addis Ababa shares 30% of the country's urban inhabitants with a population of around 4 million. About 120,000 new residents are added to the city every year. Most of this takes place in the slum areas where around 80% of Addis Ababa inhabitants' live (Teferi & Newman, 2017). Arat Kilo is an old, socially mixed slum settlement, where formal and informal structures coincide. Diverse housing typologies, ranging from single detached houses, and cluster housing to poor dwellings can be found. Additionally, the age, construction quality, and infrastructural provisions of the buildings vary but are overall substandard.

Ginfe is a slum clearance high-rise apartment settlement, which is located in the inner city of Addis Ababa, just located a short walking distance from the Arat Kilo slum. Most of the people living here were former residents of Arat Kilo.

Jakarta is a mega city with a population of 10 million and a high proportion of slum dwellings (Aji, 2015). The slum area examined is Ciliwung and the adjacent high-rise was for residents transferred from a slum clearance project. Jakarta has an entirely different culture and climate to Addis Ababa, but they share the kind of rapid growth and economic issues faced by many emerging cities.

## 8. Results on Extended Metabolism in Slums

The results from a study of two slums in Jakarta are presented first. Tables 1, 2 and 3 show the metabolism (resources and waste) and liveability characteristics of a slum that is yet to be redeveloped on the Ciliwung Riverbank and this is compared to a slum clearance project where high-rise apartments were provided to the residents.

The results show the following:

- There is a small decrease in the metabolism of the residents in the high-rise housing in comparison to the undeveloped slum on the river bank. This is

**Table 1.** Resource inputs to Ciliwung River slum settlement and high-rise apartments, Jakarta, Indonesia. Source: Arief (1998).

Input	Slum Settlement	High-Rise Apartments
<b>Water (L/household/day)</b>	248	188
<b>Energy (MJ/Household/day)</b>		
Electricity	2.3	1.2
Kerosene	60.8	57.0
Charcoal	0.9	0.15
Gasoline	3.99	7.05
Diesel	3.27	2.35
Total	71.26	67.75
<b>Land (m<sup>2</sup>/person)</b>	4.57	0.91
<b>Building materials</b>	Bricks, wood, bamboo frame, tile or tin roofs (very poor quality).	Bricks, ceramic floors, tile roofs (good quality).
<b>Food</b>	Inadequate intake.	More balanced but minimal intake.

**Table 2.** Waste outputs from Ciliwung River slum settlement and high-rise apartments, Jakarta, Indonesia. Source: Arief (1998).

Output	Slum Settlement	High-Rise Apartments
<b>Solid waste (kg/household/day)</b>	2.16 (82% into river)	1.66 (100% collected)
<b>Liquid waste (L/household/day)</b>	248 (directly into river)	188
<b>Air waste (g CO<sub>2</sub>)</b>		
Electricity	626	326
Kerosene	4,487	4,206
Charcoal	85	14
Gasoline	284	502
Diesel	241	173
Total	5,723	5,221

**Table 3.** Liveability of Ciliwung River slum settlement and high-rise apartments, Jakarta, Indonesia. Source: Arief (1998).

Parameter	Slum Settlement	High-Rise Apartments
Health	Environmental health very poor: 42 ill in 3-month period.	Environmental health relatively good: 34 ill in 3-month period.
Employment	55% street traders; 19% employed in private business; 0% home industries; Most participate in informal economy.	6% street traders; 40% employed in private business; 2% freelance workers; Most participate in formal economy;
Income (average)	Rp151,000	Rp252,000
Housing	Poor; 82% want to move.	Relatively good; Do not want to move.
Education	94% primary school and below.	44% primary school and below.
Community	High level of community; 92% know > 20% by first name; 90% happy to live there; 100% trust neighbours; 100% feel secure; 100% borrow tools from neighbours; 100% borrow money from neighbours.	Not high level of community; 44% know > 20% by first name; 76% happy to live there; 52% trust neighbours; 4% feel secure; 70% borrow tools from neighbours; 22% borrow money from neighbours.

probably due to better technology and living conditions as well as having to pay for their energy and water (most often the informal settlements have informal, unmetered energy and water provision). The wastes are much better managed as would be expected; and

- The liveability in the high-rise development is due to a reduction in poverty, but the striking difference is in the social liveability parameters where it is clear that the informal settlement has much better social capital. It has much higher levels of community trust and neighbourliness. Despite their poverty the residents like living there as they have a strong community that supports each other.

Tables 4, 5 and 6 set out the metabolism and liveability in an informal settlement in Addis Ababa and compare it to a high-rise settlement which received residents from a former informal settlement nearby.

Table 6 shows that resource consumption of energy and water are very similar with only small GHG emissions

by comparison with most households in most cities (Newman et al., 2017). The reduction in usage when people move to high-rise is probably because they are generally having to pay more than in the informal settlements for power and water which are often not in formal supply. In terms of liquid and solid waste production, each of the slum groups were almost the same as the production of solid and liquid wastes from the high-rise condominiums. Though, there is a vast difference in how they are disposed (collected). This is because of the limitations of technology in the informal settlements. Despite the fact that the high-rise apartments produce a little fewer wastes, the amount generated is almost similar, which is consistent with the expected result from the metabolism model.

Regarding liveability, even though the high-rise condominium apartment inhabitants are better off in terms of the physical environment and have access to the formal economy, the community cohesion is not as strong as with the slum dwellers. The level of social interaction among the slum settlements is very high; they meet each other almost every day and generate strong levels of

**Table 4.** Resource inputs to Arat Kilo Slum Settlement and High-Rise Apartments, Addis Ababa. Source: Authors' filed data.

Input	Slum Settlement	High-Rise Apartments
<b>Water (L/household/day)</b>	261	168
<b>Energy (MJ/Household/day)</b>		
Electricity	3.1	2.6
Kerosene	58.0	54.0
Charcoal	2.10	0.12
Gasoline	4.01	7.03
Diesel	3.37	2.45
Total	70.58	66.02

**Table 5.** Waste outputs to Arat Kilo slum settlement and high-rise apartments, Addis Ababa, Ethiopia. Source: Authors' filed data.

Waste outputs	Slum settlements	High-rise apartments inhabitants
<b>Solid waste (kg/household/day)</b>	3.1	2.6 (90% solid waste collected)
<b>Liquid waste (L/household/day)</b>	341	260
<b>Air waste (CO<sub>2</sub>)</b>		
Electricity	726	402
Kerosene	4,321	3,902
Charcoal	123	12
Gasoline	210	490
Diesel	213	180
Total	5,593	4,986

**Table 6.** Liveability of Arat Kilo slum settlement and high-rise settlement, Addis Ababa, Ethiopia. Source: Authors' filed data.

Parameter	Slum Settlements	High-Rise Settlements
Economic	30% employed in private business, government, and NGOs; 30% self-employed (informal activities); 29% unemployed; 3% pensioners; Average income Br10,560.	45% employed in private business, government, and NGOs; 43% self-employed (informal activities); 7% unemployed; 5% pensioners; Average income Br17,600.
Housing	Constructed from wood and mud; Cooking and sleeping take place in same room; 70% government owned; No bathrooms; pit latrines and communal electric meters; 43% wish to live there with minor improvement; 30% need everything unchanged.	Constructed from concrete blocks; Separate bed and kitchen rooms available; 100% privately owned; Privately owned bathrooms and electric meters; 50% wish to live there.
Education	67% primary school and below.	30% primary school and below.
Community	High level of community; 80% happy to live there; 95% feel secure; 93% enjoy access to at least one informal borrowing or lending network; 97% trust neighbours.	Low level of community; 50% happy to live there; 7% feel secure; 42% enjoy access to at least one informal borrowing or lending network; 34% trust neighbours; 60% have social tie to previous communities.

trust that leads to sharing of assets and money. There is clearly a strong community in the slum settlements. The housing improvements that have been undertaken in the high-rise condominiums compared to the slum settlement have not necessarily brought about parallel increase in social conditions. If the same level of physical infrastructure and access to the formal economy could be provided to the slum dwellers without removing their social structures, then it would obviously be a better way to improve such settlements.

### 9. Community-Based Distributed Electricity Supply

If slums are to be upgraded in a way that enables their community structure to be preserved, then the urban

planning needs to be done differently with the aim of maintaining these social structures that are so strong in the slum communities. Slum clearance with the development of high-rise to replace the buildings is clearly not working in terms of social and community values. High-rise developments that are used to provide housing for people in slums as well as other income levels that help pay for the buildings will help provide more housing options and even with high-rise its possible to develop more community-oriented high-rise design (see Bay & Lehmann, 2017).

The alternative approach as discussed above we have called the organic approach to slum development. In this approach the need will be for small scale, local, community-based energy infrastructure and other ser-

vices/infrastructure. Fortunately, the world has seen a rapid development of this localized, distributed technology so that it has now become significantly cheaper than much of the centralized, large-scale systems that have characterized urban planning in the 20th century (Green & Newman, 2017b; Lovins, 2003; Marsden, 2011). The technology and the urban planning associated with its management have been recognised as having significant application to the developing world (Brass, Carley, MacLean, & Baldwin, 2012). Mostly this requires solar PV panels and new battery storage systems that enable the electricity to be used in the evenings. Such systems take up very little space (rooftops) and a small area for the battery. They can be provided for a group of houses from just a few to several hundred depending on the management system that it is constructed around.

The management systems associated with community-based distributed power have been described as 'citizen utilities' (Green & Newman, 2017a) and utilize a micro-grid linking just the local householders into a locally managed structure. The micro-grid can be linked into the rest of the city's grid and be used to make money for those who belong to the local system by exporting power at times (Gies, 2012). By having their own batteries, the local Citizen Utility is more resilient if the rest of the system fails which in developing cities can be quite frequent. Details of how such systems work are being trialled (Green & Newman, 2017b) and need to be demonstrated more in slum communities to show how feasible it can be.

## 10. Urban Planning Implications

### 10.1. Unlocking Markets for Housing Regeneration

The community-distributed power system offers much to slums and to governments as the cost of redevelopment, especially through high-rise building, is significant. These welfare approaches also may not unlock other approaches to regenerating urban areas. Organic upgrading not only should be a cheaper option overall, but this approach also offers a way for people to improve their own homes once economic development is facilitated by the provision of locally-generated and managed electricity. If the settlement is informal in terms of its land tenure, then this can rapidly be solved as a way of ensuring the Citizen Utility is formalised as well as providing the major step forward of having a formalised address and ability to be recognised for bank finance. The formal process enables households to take out loans and begin fixing their own houses as well as setting up employment opportunities. Thus the Citizen Utility-based approach to providing zero-carbon power can provide a major step towards ending extreme poverty as well as ensuring that no emissions are created. This is the fundamentals of the 1.5 °C agenda.

### 10.2. Inclusive and Participatory Development

Community-based power systems within slums not only improves the economic situation of the slum dwellers but it is inherently more sensitive to the social infrastructure within the organic structure of the slums. This social capital is likely to be a significant contributor to the ending of extreme poverty through its highly inclusive mechanism. It can also be linked to more participatory governance in general (MacPherson, 2013). Techniques for enabling the process of inclusion have been developed as a major tool in urban planning (Hartz-Karp & Marinova, 2017).

### 10.3. Local Environmental Improvement

The same community-based approach can be used to assist with water and waste management using new technology such as MBR sewage treatment that not only can fit seamlessly into small communities but can provide a water source for growing local food and greening (D'Amato, 2010; Zodrow et al., 2017). Both can be upgraded as a local, distributed, community-based approach rather than a highly centralized mechanism as has been the way in the past. This can use a range of small-scale local water and waste systems that can be largely self-sufficient but also link to the city-wide grids for resilience and reliability (Cowden, 2008; MacPherson, 2013). Both of these systems can be part of the same Citizen Utility and enable local environmental improvement.

A more community-based approach to infrastructure appears to mean improving the living conditions of the urban poor in a way that does not negatively impact on the global and local environment using more natural resources than the existing experience. This would suggest a policy implication for the 1.5 °C agenda.

## 11. Financing

The Paris Agreement has established a broad mechanism for funding and financing infrastructure that is both low carbon and helps achieve the SDGs. By enabling a Citizen Utility structure within slums it is possible to create an on-going structure that can directly utilize the funds from the global Green Fund but can raise local finance to support such development (Pahl, 2012).

## 12. Conclusion

The 1.5 °C agenda is largely an issue for the developed world and emerging places like China and India who need to adopt zero carbon economic development mechanisms. However, Africa and places like Indonesia will need to show they can be part of this new agenda. Slums are a dominant part of the agenda for urban development in the emerging world and like all new city development will require a different approach if it is to be part of the 1.5 °C agenda. This article shows that there is

an urban planning approach using more organic upgrading and community-based infrastructure with Citizen Utilities that can enable slums to leapfrog into a future which is both zero carbon and can achieve the SDGs. Urban planners need to establish demonstrations of such Citizen Utility-based slum regeneration projects.

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### Conflict of Interests

The authors declare no conflict of interests.

### References

- Aji, P. (2015). *Summary of Indonesia's poverty analysis*. Mandaluyong: Asian Development Bank.
- Aklin, M., Bayer, P., Harish, S. P., & Urpelainen, J. (2015). Quantifying slum electrification in India and explaining local variation. *Energy*, *80*, 203–212.
- Arief, A. (1998). *A sustainability assessment of squatter redevelopment in Jakarta* (Master's thesis). Murdoch University, Perth.
- Baldwin, E., Brass, J. N., Carley, S., & MacLean, L. M. (2015). Electrification and rural development: Issues of scale in distributed generation. *Wiley Interdisciplinary Reviews: Energy and Environment*, *4*(2), 196–211.
- Bay, J. H. P., & Lehmann, S. (Eds.). (2017). *Growing compact: Urban form, density and sustainability*. Abingdon: Taylor & Francis.
- Bhatia, M., & Angelou, N. (2015). *Beyond connections: Energy access redefined* (ESMAP Technical Report 008/15). Washington, DC: World Bank.
- Brass, J. N., Carley, S., MacLean, L. M., & Baldwin, E. (2012). Power for development: A review of distributed generation projects in the developing world. *Annual Review of Environment and Resources*, *37*, 107–136.
- Burra, S. (1999). *Resettlement and rehabilitation of the urban poor: The story of Kanjur Marg* (Working Paper n.º 99). Mumbai: Society for the Promotion of Area Resource Centres. Retrieved from [rlarrdc.org.in/images/MUTP%20Project.pdf](http://rlarrdc.org.in/images/MUTP%20Project.pdf)
- Casillas, C. E., & Kammen, D. M. (2010). The energy-poverty-climate nexus. *Science*, *330*(6008), 1181–1182.
- Cowden, J. R. (2008). *Planning and adaptation measures for urban slum communities in West Africa: Stochastic rainfall modeling applied to domestic rainwater harvesting and climate change adaptation*. Houghton, MI: Michigan Technological University.
- D'Amato, V. (2010). New concepts for urban and sub-urban water management using distributed systems. *Proceedings of the Water Environment Federation*, *2010*(2), 501–530.
- Diffenbaugh, N. S., Singh, D., Mankin, J. S., Horton, D. E., Swain, D. L., Touma, D., . . . Rajaratnam, B. (2017). Quantifying the influence of global warming on unprecedented extreme climate events. *Proceedings of the National Academy of Sciences*, *114*(19), 4881–4886.
- Dunlap, R. E. (2013). Climate change skepticism and denial: An introduction. *American Behavioral Scientist*, *57*(6), 691–698.
- French, M. A., & Lalande, C. (2013). Green cities require green housing: Advancing the economic and environmental sustainability of housing and slum upgrading in cities in developing countries. In R. Simpson & M. Zimmermann. *The economy of green cities* (pp. 275–284). The Netherlands: Springer.
- Frenzel, F. (2016). *Slumming it: The tourist valorization of urban poverty*. London: Zed Books.
- Gies, E. (2012). Making the consumer an active participant in the grid. *The New York Times*. Retrieved from <https://www.nytimes.com/2010/11/29/business/energy-environment/29iht-rbogferc.html>
- Givens, J. E. (2015). Urbanization, slums, and the carbon intensity of well-being: Implications for sustainable development. *Human Ecology Review*, *22*(1), 107–128.
- GNESD. (2013). *Country report (India): Energy poverty in developing countries' urban poor communities. Assessments and recommendations. Urban and Peri-urban energy access III*. (Report prepared for the Global Network on Energy for Sustainable Development). Roskilde: The Energy and Resources Institute (TERI).
- Green, J., & Newman, P. (2017a). Citizen utilities: The emerging power paradigm. *Energy Policy*, *105*, 283–293.
- Green, J., & Newman, P. (2017b). Planning and governance for decentralised energy assets in medium-density housing: The WGV Gen Y case study. *Urban Policy and Research*, *35*(4), 1–14. doi:10.1080/08111146.2017.1295935
- Hartz-Karp, J., & Marinova, D. (Eds.). (2017). *Methods for sustainability research*. London: Edward Elgar.
- IAEA. (2016). *Climate change and nuclear power 2016*. Vienna: IAEA.
- Jacobs, J. (1961). *The death and life of great american cities*. New York, NY: Random House.
- Jones, P. (2017). Formalizing the informal: Understanding the position of informal settlements and slums in sustainable urbanization policies and strategies in Bandung, Indonesia. *Sustainability*, *9*(8), 1436.
- Ley, D. (2014). Modernism, postmodernism and the struggle for place. In J. Agnew & J. Duncan (Eds.), *The power of place: Bringing together geographical and sociological imaginations* (pp. 44–65). Boston: Unwin Hyman.
- Lovins, A. B. (2003). Small is profitable: The hidden eco-

- conomic benefits of making electrical resources the right size. *Refocus*, 4(3), 12–12.
- MacPherson, L. (2013). Participatory approaches to slum upgrading and poverty reduction in African cities. *Hydra*, 1(1), 85–95.
- Marsden, J. (2011). *Distributed generation systems: A new paradigm for sustainable energy*. Paper presented at the Green Technologies Conference. Piscataway, NJ.
- Newman, P., & Kenworthy, J. (1999). *Sustainability and cities*. Washington, DC: Island Press.
- Newman, P. (2017a). Decoupling economic growth from fossil fuels. *Modern Economy*, 8(06), 791.
- Newman, P. (2017b). The rise and rise of the renewable city. *Renewable Energy and Environmental Sustainability*, 4(2), 1–5.
- Newman, P., Beatley, T., & Boyer, H. (2017). *Resilient Cities: Overcoming fossil fuel dependence*. Washington, DC: Island Press.
- Nygaard, I. (2009). The compatibility of rural electrification and promotion of low-carbon technologies in developing countries: The case of Solar PV for Sub-Saharan Africa. *European Review of Energy Markets*, 3(2), 125–158.
- Pahl, G. (2012). *Power from the people: How to organize, finance, and launch local energy projects*. White River Junction, VT: Chelsea Green Publishing.
- Parikh, P., Chaturvedi, S., & George, G. (2012). Empowering change: The effects of energy provision on individual aspirations in slum communities. *Energy Policy*, 50, 477–485.
- Rodgers, R. G. (1997). *Cities for a small planet*. London: Faber & Faber.
- Rogelj, J., Den Elzen, M., Höhne, N., Fransen, T., Fekete, H., Winkler, H., . . . Meinshausen, M. (2016). Paris Agreement climate proposals need a boost to keep warming well below 2 °C. *Nature*, 534(7609), 631–639.
- Satterthwaite, D. (2004). *The under-estimation of urban poverty in low and middle-income nations* (Vol. 14). London: IIED.
- Satterthwaite, D. (2016). Missing the millennium development goal targets for water and sanitation in urban areas. *Environment and Urbanization*, 28(1), 99–118.
- Schaengold, D. (2006). *Clean distributed generation for slum electrification: The case of Mumbai*. Princeton, NJ: Woodrow Wilson School Task Force on Energy for Sustainable Development.
- Siddiqui, F. A., & Newman, P. (2005). Grameen Shakti: Financing renewable energy in Bangladesh. *Indian Renewable Energy Development Agency*, 2(1), 31–38.
- Singh, R., Wang, X., Mendoza, J. C., & Ackom, E. K. (2015). Electricity (in)accessibility to the urban poor in developing countries. *WIREs Energy Environment*, 4, 339–353. doi:10.1002/wene.148
- Takesada, N., Manatunge, J., & Herath, I. L. (2008). Resettler choices and long-term consequences of involuntary resettlement caused by construction of Kotmale Dam in Sri Lanka. *Lakes & Reservoirs: Research & Management*, 13(3), 245–254.
- Teferi, A. Z., & Newman, P. (2014). *Older slums in Addis Ababa: How do they work?* Paper presented at the Responsive Urbanism in Informal Areas Conference, Cairo.
- Teferi, A. Z., & Newman, P. (2017). Slum regeneration and sustainability: Applying the extended metabolism model and the SDG's. *Sustainability*, 9(12), 2273. doi:10.3390/su9122273
- The World Bank. (2012). *Action plan for moving slum upgrading to scale*. New Delhi: UNDP World Bank/Water and Sanitation Program.
- Tollin, N., & Hamhaber, J. (2017). Sustainable and resilient cities: SDGs, new urban agenda and the Paris Agreement. *Energia Ambiente e innovazione*, 1(8). doi:0.12910/EAI2017-001
- Turner, J. F. (1976). Approaches to government-sponsored housing. *Ekistics*, 42(242), 4–7.
- UN-Habitat. (2003). *The challenge of slums: Global report on human settlements 2003*. London: Earth Scan.
- UN-Habitat. (2006). *Enabling shelter strategies: Review of experiences from two decades of implementation*. Nairobi: UN-Habitat Programme.
- UN-Habitat. (2011). *Condominium housing in Ethiopia*. Nairobi: The Integrated Housing Development Programme.
- UN-Habitat. (2013). *State of the world's cities 2012/2013: Prosperity of cities*. London: Routledge.
- UN-Habitat. (2016). *Urbanization and development: Emerging features* (World Cities Report 2016). United Nations Human Settlements Programme.
- UN. (2016). *Urbanization and development* (World Cities Report 2016). Nairobi: Emerging Feature. Retrieved from <http://wcr.unhabitat.org>
- UNDESA. (2014). *World urbanization prospects*. Department of Economic and Social Affairs (UNDESA). Retrieved from <http://esa.un.org/unpd/wup/Highlights/WUP2014-Highlights.pdf>
- United Nations. (2016). *The sustainable development goals report 2016*. New York, NY: United Nations.
- Urpelainen, J. (2014). Grid and off-grid electrification: An integrated model with applications to India. *Energy for Sustainable Development*, 19, 66–71.
- Wollenberg, E., Richards, M., Smith, P., Havlík, P., Obersteiner, M., Tubiello, F. N., . . . Vuuren, D. P. (2016). Reducing emissions from agriculture to meet the 2 °C target. *Global Change Biology*, 22(12), 3859–3864.
- Yntiso, G. (2008). Urban development and displacement in Addis Ababa: The impact of resettlement projects on low-income households. *Eastern Africa Social Science Research Review*, 24(2), 53–77.
- Zodrow, K. R., Li, Q., Buono, R. M., Chen, W., Daigger, G., Dueñas-Osorio, L., . . . Logan, B. E. (2017). Advanced materials, technologies, and complex systems analyses: Emerging opportunities to enhance urban water security. *Environmental Science & Technology*, 51(18), 10274–10281.



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# Consolidated references

This bibliography consolidates the references from the exegesis and publications contained in this thesis.

## A

- Abdissa A. & Walelegn W. (2016). 'Sanitation practice of slum communities in Addis Ababa, Ethiopia.' *Science Journal of Public Health*. 4(4), 297–304.
- Abdulwasi, S. (2009). *An assessment of the effectiveness of the upgrading and revitalization strategies for housing development in case of Harar city* MSc Thesis, Ethiopian Civil Service University, Addis Ababa, Ethiopia.
- Abebe, G. & Hesselberg, J. (2015) 'Community participation and inner-city slum renewal: Relocated people's perspectives on slum clearance and resettlement in Addis Ababa.' *Development in Practice*, 25, 551–562.
- Abebe, G. & Hesselberg, J. (2013), 'Implications of urban development-induced resettlement on poor households in Addis Ababa', *Ghana Journal of Geography* 5, 32–50.
- Abu-Ghazze, T. M. (1999), 'Housing layout, social interaction, and the place of contact in Abu-Nuseir, Jordan.' *Journal of Environmental Psychology* XIX, 41–73.
- Adamu, W (2015), *The challenges and opportunities of slum upgrading in Addis Ababa: The case of Arada Sub city, Addis Ababa*. Master thesis, Addis Ababa University, Ethiopia.
- Addis Ababa Chamber of Commerce and Sectoral Associations (2011), *Assessment of Urban Development practices on Business Expansion in Ethiopia*.
- Alemayehu, E.Y. (2008). *Revisiting 'slums', revealing responses. Urban upgrading in tenant dominated inner-city settlements in Addis Ababa, Ethiopia*. (PhD) thesis. Norwegian University of Science and Technology, Trondheim.
- Aman M. (2016) *Development induced displacement in the context of UN guiding principles and AU convention: Experience from Addis Ababa City Urban Renewal*

*Projects* (Doctoral thesis). Department of Political Science and International Relations. Addis Ababa University, Ethiopia.

Ambaye DW (2022), 'Informal settlement in Ethiopia, the Case of Two Kebeles in Bahir Dar City'. TS06 D-Informal Settlement Issues, Spatial Development, Planning and Governance (ed) Bridging the Gap between Cultures. Retrieved from [https://www.fig.net/resources/proceedings/fig\\_proceedings/fig2011/papers/ts06d/ts06d\\_ambaye\\_5096.pdf](https://www.fig.net/resources/proceedings/fig_proceedings/fig2011/papers/ts06d/ts06d_ambaye_5096.pdf)

AMES (2015). *Small towns Big returns: Economic and social impact of the Karen resettlement in Nhill*. A joint AMES and DELOITTE Access Economics Report. Retrieved from <https://www.ames.net.au/files/file/Research/19933%20AMES%20Nhill%20Report%20LR.pdf>

Anríquez, G., & Stamoulis, K. (2007). *Rural development and poverty reduction: Is agriculture still the key?* ESA Working Paper no 07-02. Agriculture Development Economics Division. Retrieved from <http://www.fao.org/3/a-ah885e.pdf>

Arcila, C. A. (2008). *Learning from slum upgrading and participation: A case study of participatory slum upgrading in the emergence of new governance in the city of Medellín–Colombia*. Masters thesis, Stockholm: Kungliga Tekniska Högskolan.

Argaw, B. A. (2017). *Regional inequality of economic outcomes and opportunities in Ethiopia. A tale of two periods*. WIDER Working Paper 2017–18. United Nations University. Retrieved from <https://www.wider.unu.edu/sites/default/files/wp2017-118.pdf>

Arief, A. (1998). *A sustainability assessment of squatter redevelopment in Jakarta* (Master's thesis). Murdoch University.

Arimah, B.C., & Branch, C.M. (2011). *Slums as expressions of social exclusion: Explaining the prevalence of slums in African countries*. Paper presented at OECD International Conference on Social Cohesion and Development, Paris, (pp. 20–21).

Asefa, S. (ed). (2005) *The economics of sustainable development*. W.E. Upjohn Institute for Employment Research. Kalamazoo, Michigan.

Asefa, S., & Huang, W. C. (Eds.). (2015). *The political economy of good governance*. WE Upjohn Institute.

Asfaw, M., Zeluel, A., & Berhe, S. (2011). *Assessment of urban development practices on business expansion in Ethiopia*. Addis Ababa Chamber of Commerce and Sectoral Associations.

## **B**

Bag, S., Seth, S., & Gupta, A. (2016). *A comparative study of living conditions in slums of three metro cities in India*. Leeds University Business School Working Paper No 16-07.

Banerjee, A., Bhawalkar, J.S., Jadhav, S. L., Rathod, H., & Khedkar, D.T. (2012). Access to health services among slum dwellers in an industrial township and surrounding rural areas: a rapid epidemiological assessment. *Journal of Family Medicine and Primary Care*, 1(1), 20.

Baran, P (1964). *On distributed communications, introduction to distributed communication networks*, Rand Corporation. Retrieved from [http://www.rand.org/content/dam/rand/pubs/research\\_memoranda/2006/RM3420.pdf](http://www.rand.org/content/dam/rand/pubs/research_memoranda/2006/RM3420.pdf)

Bay, J.H. (2010). 'Towards a fourth ecology: Social and environmental sustainability with architecture and urban design.' *Journal of Green Building*, 5, 176–197.

Bay, J.H. (2004). 'Sustainable community and environment in tropical Singapore high-rise housing: The case of Bedok Court condominium.' *Architectural Research Quarterly*, 8, 333–343.

Bay, J.H. & Lehmann, S. (eds.) (2017). *Growing compact: Urban form, density and sustainability*. Taylor & Francis.

Bay, J.H. & Ong, B.L. (2006). *Tropical sustainable architecture: Social and environmental dimensions*. Architectural Press: Oxford, MA,.

Beall, J., Crankshaw, O., & Parnell, S. (2014). *Uniting a divided city: Governance and social exclusion in Johannesburg*. Routledge.

Berger, A.S (1978), *The city: Urban communities and their problems*, C. Brown Company Publishers, Iowa.

- Bhatia, M., & Angelou, N. (2015). *Beyond connections: energy access redefined. Executive Summary*. IBRD/WB, Washington, D.C.
- Bjerkli, C. (2013). 'Governance on the ground: A study of solid waste management in Addis Ababa, Ethiopia'. *International Journal of Urban and Regional Research*, 37(4), 1273–1287.
- Brass, J. N., Carley, S., MacLean, L. M., & Baldwin, E. (2012). 'Power for development: A review of distributed generation projects in the developing world.' *Annual Review of Environment and Resources*, 37, 107–136.
- Brown, D., & McGranahan, G. (2016). 'The urban informal economy, local inclusion and achieving a global green transformation.' *Habitat International*, 53, 97–105.
- Brundtland, G. H. (1987). *Report of the World Commission on Environment and Development (1987): Our common future*. World Commission for Environment and Development.
- Burra, S. (2005). 'Towards a pro-poor framework for slum upgrading in Mumbai, India.' *Environment and Urbanization*, 17(1), 67–88.
- Burra, S. (1999). 'Resettlement and rehabilitation of the urban poor: The story of Kanjur Marg', Working Paper No. 99, *Society for the Promotion of Area Resource Centres*, India. Retrieved from [rlarrdc.org.in/images/MUTP%20Project.pdf](http://rlarrdc.org.in/images/MUTP%20Project.pdf)

## C

- Cadavid, P. R. (2011). *The impacts of slum policies on households' welfare: The case of Medellin (Colombia) and Mumbai (India)* (Doctoral dissertation, École Nationale Supérieure des Mines de Paris).
- Cape Town Project Center (2012). Supporting Reblocking and Community Development in Mtshini Wam.  
<http://wp.wpi.edu/capetown/homepage/projects/p2012/mtshini-wam>
- Carpenter J.P., Daniere, A.G. & Takahashi, L. M. (2004). 'Cooperation, trust, and social capital in Southeast Asian urban slums.' *Journal of Economic Behavior and Organization* 55 (4): 533–551.
- Central Statistical Agency of Ethiopia (CSA), (2016). *Ethiopia demographic and health survey 2016: Key Indicators Report*. Addis Ababa, Ethiopia.

- Central Statistical Agency of Ethiopia (CSA), (2012), *Analytical report on Urban Employment Unemployment Survey. Statistical Bulletin. Addis Ababa, Ethiopia.*
- Cervantes-Godoy, D. & J. Dewbre (2010), 'Economic importance of agriculture for poverty reduction'. *OECD Food, Agriculture and Fisheries Working Papers*, No. 23, OECD Publishing.
- Chattopadhyay, S., & Biswas, A. (2010). 'Slum improvement through legal framework in India'. *International Journal for Housing Science and its Applications*, 34(2).
- Chirisa, I., 2008. 'A population growth and rapid urbanization in Africa: Implications for sustainability'. *Journal of Sustainable Development in Africa*. 10(2) 361–394.
- Chocat, B (2002), 'Sustainable management of water in cities. Valencia', Universidad Internacional Menendez Pelayo. Retrieved from <http://www.petus.eu.com/graphics/FRsusmanagecitiesBC.pdf>
- Cities Alliance (1999). *Cities without slums: Action plan for moving slum upgrading to scale*. Washington DC: Cities Alliance.
- Commonwealth of Australia (1996). State of the Environment Report; CSIRO: Collingwood, VIC, Retrieved from <https://soe.environment.gov.au/sites/g/files/net806/f/1996-soe.pdf?v=1487244614>
- Coplák, J. & Rakšányi, P. (2003). *Planning sustainable settlements*. Bratislava: Slovak University of Technology. Retrieved from <http://www.ecocity.szm.com/framework.html#overall>.
- Corburn, J. & Sverdlik, A. (2017), 'Slum upgrading and health equity,' *International Journal of Environmental Research and Public Health*, 14(4), 342.
- Cowden, J.R, (2008). *Planning and adaptation measures for urban slum communities in West Africa : stochastic rainfall modeling applied to domestic rainwater harvesting and climate change adaptation*. Dissertation, Michigan Technological University. Retrieved from <http://digitalcommons.mtu.edu/etds/724>

## D

- Dafe, F. (2009). *No business like slum business? The political economy of the continued existence of slums: A case study of Nairobi*. Development Studies Institute, London School of Economics and Political Science.
- Daniel A, (2010), 'Urban environmental challenges in developing cities: The case of Ethiopian Capital Addis Ababa', *International Journal of Environmental, Chemical, Ecological, Geological and Geophysical Engineering* 4. Retrieved from <http://waset.org/publications/12541/urban-environmental-challenges-in-developing-cities-the-case-of-ethiopian-capital-addis-ababa>
- Davis, M. (2007) *Planet of slums*. London: Verso.
- Davis, M. (2006). Planet of slums. *New Perspectives Quarterly*, 23(2), 6–11.
- d’Cruz, C & Satterthwaite, D. (2005), 'Building homes, changing official approaches: The work of urban poor organizations and their federations and their contributions to meeting the Millennium Development Goals in urban areas', *Poverty Reduction in Urban Areas Series, Working Paper 16*, IIED, London. Retrieved from <http://pubs.iied.org/pdfs/9547IIED.pdf>
- Diffenbaugh, N. S., Singh, D., Mankin, J. S., Horton, D. E., Swain, D. L., Touma, D., ... & Rajaratnam, B. (2017). Quantifying the influence of global warming on unprecedented extreme climate events. *Proceedings of the National Academy of Sciences*, 114(19), 4881–4886.
- Duguma, T.D., (2015). 'Assessment of determinants and modes of access to urban residential land and housing among different income households in Jimma City Administration, Oromia National Regional State, South West Ethiopia'. *International Journal of Science and Research*, 2319–7064.
- Dunlap, R. E. (2013). 'Climate change skepticism and denial: An introduction'. *American Behavioral Scientist*, 57(6), 691–698.
- Dupont, V. (2008). 'Slum demolitions in Delhi since the nineties: In whose interest?' *Economic and Political Weekly*, 43(28), 79–87.
- Durand-Lasserve, A. & Selod, H. (2009). 'The formalization of urban land tenure in developing countries'. In Lall, S.V., Freire, M., Yuen, B. et al (eds). *Urban land*

*markets – improving land management for successful urbanization.* Springer: Dordrecht, Netherlands, 1, 101–132.

## E

Ejigu, A.G. (2012). 'The making of "modern" Addis: The role of the "Addis" myth.' In *Biennial Conference of the International Association for the Study of Traditional Environments, October 4–7, 2012, Portland, OR, USA.*

Ellis, F. & Tassew, W. (2005). *Ethiopian participatory poverty assessment, 2004–2005*, Addis Ababa, Ethiopia.

Emebet, M., (2008), *Urban poverty in Ethiopia: The economic and social adaptation of women.* Addis Ababa University Press, Addis Ababa.

Ethiopia Ministry of Health, (2015). *National Hygiene and Sanitation Strategic Action Plan for Rural, Peri-Urban and Informal Settlements in Ethiopia, Addis Ababa.*

Evas, E. 2013. 'Two billion slum dwellers.' Forbes. Retrieved from [http://www.forbes.com/2007/06/11/third-world-slums-biz-cx\\_21cities\\_ee\\_011slums.html](http://www.forbes.com/2007/06/11/third-world-slums-biz-cx_21cities_ee_011slums.html).

## F

Federal Democratic Republic of Ethiopia (FDRE), (2011) *Ethiopia's Growth and Transformation Plan (GTP) 2010/11–2014/15.* Ministry of Finance and Economic Development, Addis Ababa.

Field, E. M., & Kremer, M. (2006). *Impact evaluation for slum upgrading interventions.* World Bank, Poverty Reduction and Economic Management, Thematic Group on Poverty Analysis, Monitoring and Impact Evaluation.

Forster, W., Gruber, H., Hansen, K.E., Tosics, I., Szolgayova, E. & Hauri, E., (1996). *Strategies to implement human settlements policies on urban renewal and housing modernization,* UN Publications, Geneva, 11–16.

Fox, S. (2014). 'The political economy of slums: Theory and evidence from Sub-Saharan Africa'. *World Development*, 54, 191–203.

French M.A. & Lalande, C. (2013) 'Green cities require green housing: advancing the economic and environmental sustainability of housing and slum upgrading in cities



in developing countries'. In *The Economy of Green Cities* (pp. 257–284). Springer Netherlands.

Frenzel, F. (2016). *Slumming it: the tourist valorization of urban poverty*. Zed Books Ltd.

## G

Gebre, G. G. (2012). 'Determinants of food insecurity among households in Addis Ababa city, Ethiopia.' *Interdisciplinary Description of Complex Systems*, 10(2), 159–173.

George, S. (2015). 'Building sustainable cities: Tools for developing new building practices?' *Global Networks*, 15, 325-342.

Giddings, B., Hopwood, B. & O'Brien, G. (2002). 'Environment, economy and society: fitting them together in sustainable development.' *Sustainable Development*, 10(4), 187–196.

Gies, E. (2012). 'Making the consumer an active participant in the grid', *The New York Times*, 29 November 2010.

Gilbert, A. (2007). 'The return of the slum: Does language matter?' *International Journal of Urban and Regional Research*, 31(4), 697–713.

Girouard, M. (1985) *Cities and people*. Yale University Press: New Haven, CT,.

Gittleman M. *Urban expansion in Addis Ababa: Effects of the decline of urban agriculture on livelihood and food security*. A paper presented at the United Nations 17th Commission on Sustainable Development. 2009.

Glaeser, E. (2011). *Triumph of the city: How our greatest invention makes us richer, smarter, greener, healthier, and happier*. Penguin.

Goitom, G. (1996). 'Aspect of poverty in the city of Addis Ababa: Profile and Policy Implication', In the *Ethiopian Economy Poverty and Poverty Alleviation, Proceedings of the Fifth Annual Conference on the Ethiopian Economy*, Addis Ababa, Ethiopia.

Gollagher, M., & Hartz-Karp, J. (2013). 'The role of deliberative collaborative governance in achieving sustainable cities.' *Sustainability*, 5(6), 2343–2366.

- Gossaye, A (2001). *Inner-city renewal in Addis Ababa. The impact of resettlement on the socio-economic and housing situation of low-income residents.* (PhD Thesis) NTNU, Trondheim: Department of Urban Design and Planning.
- Gossaye, A. (2000). Inner-city renewal and locational stability of the poor: a study of inner-city renewal program in Addis Ababa, Ethiopia. *WIT Transactions on Ecology and the Environment*, 39.
- Green, J., & Newman, P. (2017a). 'Citizen utilities: The emerging power paradigm.' *Energy Policy*, 105, 283293.
- Green, J., & Newman, P. (2017b). 'Planning and governance for decentralised energy assets in medium-density housing: The WGV Gen Y Case Study.' *Urban Policy and Research*, 1–14.
- Gulyani, S., & Bassett, E. M. (2007). 'Retrieving the baby from the bathwater: slum upgrading in Sub-Saharan Africa.' *Environment and Planning C: Government and Policy*, 25(4), 486–515.

## H

- Hadush, E. (2011). *Factors influencing affected group participation in urban redevelopment in Addis Ababa: The Case of Senga Tera-Fird Bet I Project.* Rotterdam: The Netherlands.
- Hall, P (1988), *Cities of tomorrow: An intellectual history of urban planning and design in the twentieth century*, Basil Blackwell, Oxford.
- Hannum, H. (1995). The status of the Universal Declaration of Human Rights in national and international law. *Ga. J. Int'l & Comp. L.*, 25, 287
- Hardoy, E, Mitlin, D, & Satterthwaite, D (2011), *Environmental problems in an urbanizing world: Finding solutions in cities in Africa, Asia and Latin America*, 2nd edn, Routledge.
- Haregewoin, Y.M. (2007) *Integrated housing development programs for urban poverty alleviation and sustainable urbanization: the case of Addis Ababa.* In ENHR International Conference on Sustainable Urban Areas. Rotterdam.

Hehl, R. & Stollman, J (2010), *New towns for the 21st century: The planned vs. the unplanned city: new-town-to-be: Kotebe Hana Mariam*, SUN Architecture, Amsterdam.

Hermanson, J.A. (2005). *Slums, informal settlements and inclusive growth in cities: Examples from Morocco and Colombia*. IHC Global Coalition for Inclusive Housing and Sustainable Cities, Washington, DC.

Hoskins, W.G. (1970), *The making of the English landscape*, Penguin Books, London.

Hove, M Ngwerume, E T & Muchemwa, S (2013). 'The urban crisis in Sub-Saharan Africa.' *Stability*, 2(1): 7, 1–14.

## I

Imparato, I., & Ruster, J. (2003). *Slum upgrading and participation: Lessons from Latin America*. World Bank Publications.

International Atomic Energy Agency (IAEA). (2016). *Climate change and nuclear power 2016*, 1–113, Austria.

International Model United Nations Association (IMUNA) (2015). *Promoting sustained urban growth in Sub Saharan Africa; improving living conditions in slums In South East Asia*.

## J

Jacobs, J (1961), *The death and life of great American cities*, New York: Random House,

Jerome, F, (1990), *Human geography: Landscape of human activities* (2nd edn), USA, WCB Publishers.

Jha, G. & Khosla, R. (2005). *Economics of resettling low-income settlements (slums) in urban areas: A case for on site upgrading. Final Report*. South Asia Network of Economic Research Institute, New Delhi.

Jiboye A.D. (2011). Sustainable urbanization: Issues and challenges for effective urban governance in Nigeria. *Journal of Sustainable Development*. 4(6), 211–224.

Jones, B. (2012), "'Bankable slums": The global politics of slum upgrading', *Third World Quarterly*, 33(5), 769–789.

Jones, P. (2017). 'Formalizing the informal: Understanding the position of informal settlements and slums in sustainable urbanization policies and strategies in Bandung, Indonesia.' *Sustainability*, 9(8), 1436.

## K

Kassahun, S., & Tiwari, A. (2012). 'Urban development in Ethiopia: Challenges and policy responses.' *The IUP Journal of Governance and Public Policy* 7(1) 59–75.

Keare, D. H. & Parris, S. (1992,) 'Evaluation of shelter programs for the urban poor: principal findings', *World Bank Staff Working Papers*, number 547, Washington, DC, The World Bank.

Klemek, C (2011), *The Transatlantic collapse of urban renewal, postwar urbanism from New York to Berlin*. Chicago: University of Chicago Press.

Kuma, T. (2004). *Dry waste management in Addis Ababa city*. In *A paper presented on teaching workshop from January 5/16th in Addis Ababa*.

## L

Lemanski, C. (2011). 'Moving up the ladder or stuck on the bottom rung? Homeownership as a solution to poverty in urban South Africa.' *International Journal of Urban and Regional Research*, 35(1), 57–77.

Ley, D. (2014). 'Modernism, postmodernism and the struggle for place'. In Agnew A.J. & Duncan J.S. (eds). *The power of place: Bringing together geographical and sociological imaginations*. Routledge: Oxon, UK.

Licha, I. (2004) *Citizens in charge: managing local budgets in East Asia and Latin America*, Inter American Bank.

Lovins, A.B. (2003). *Small is profitable: the hidden economic benefits of making electrical resources the right size*. Rocky Mountain Institute, Snowmass, CO, US.

Lucci, P (2015), *What works in improving the living conditions of slum dwellers, A review of evidence across four programmes*, Overseas Development Institute, London.

## M

- MacPherson, L. (2013). 'Participatory approaches to slum upgrading and poverty reduction in African cities.' *Hydra*, 1(1), 85–95.
- Majale, M. (2002 ) *Towards pro-poor regulatory guidelines for urban upgrading: Regulatory guidelines for urban upgrading*. ITDG, Warwickshire, UK.
- Markville Council (2012), *Strategy for a water sensitive community 2012 – 2021*, Sydney.
- Marsden, J. (2011). *Distributed generation systems: A new paradigm for sustainable energy*. In Green Technologies Conference (IEEE-Green), IEEE.
- Martha Davis Urban Institute, (2006). *Deepening decentralization in Amhara Regional State and Tigray National Regional State and restructuring of nine urban local governments. Guidelines on Upgrading Kebele Housing and Neighborhoods*. The Urban Institute, Washington DC.
- Marx, B., Stoker, T., & Suri, T. (2013). 'The economics of slums in the developing world.' *The Journal of Economic Perspectives*, 27(4), 187-210.
- McQuillan, D (2014), 'Smart slums: Utopian or dystopian vision of the future?' *The Guardian* 6 October 2014. Retrieved from <https://www.theguardian.com/global-development-professionals-network/2014/oct/06/smart-slums-smart-city-kenya-mapping>
- Melake Selam P., (1997), 'Some aspects of survival strategies of the poor inhabitants of the city of Addis Abab', In Emebet, M. (2008), *Urban poverty in Ethiopia: The economic and social adaptation of women*, Addis Ababa University Press, Addis Ababa.
- Merkel, S. & Otai, J. (2007), *Meeting the health needs of the urban poor in African informal settlements: best practices and lessons learned*, Nairobi.
- Millington, K.A. & Cleland, J. (2017) *Counting people and making people count: Implications of future population change for sustainable development – k4d helpdesk report*; Institute of Development Studies: Brighton, UK. Retrieved from <https://opendocs.ids.ac.uk/opendocs/handle/123456789/13015>
- Ministry of Finance and Economic Development (2012). *Ethiopia's progress towards eradicating poverty: An interim report on poverty analysis study (2010/11)*.

Ministry of Urban Development, Housing and Construction, (2014), national report on housing & sustainable urban development.

Minx, J.C., Creutzig, F., Medinger, V., Ziegler, T., Owen, A. & Baiocchi, G., (2011). *Developing a pragmatic approach to assess urban metabolism in Europe: A report to the Environment Agency* prepared by Technische Universität Berlin and Stockholm Environment Institute, Climatecon Working Paper 01/2011, Technische Universität Berlin.

Mitlin D., (2003). *The economic and social processes influencing the level and nature of chronic poverty in urban areas*. Chronic Poverty Research Centre Working Paper No 29.

Montero, G M (2016). *pAnalytic framework: resettlement vs upgrading the case of Colbot in Freetown, Sierra Leone*, A dissertation submitted in partial fulfilment of the requirements for the Msc Development Administration & Planning The Bartlett -Development Planning Unit University College London.

Montero, M G, (2016), *Analytic framework: resettlement vs upgrading the case of Colbot in Freetown, Sierra Leone*, Maters Thesis, University College London [http://www.slurc.org/uploads/1/6/9/1/16915440/dissertation\\_mgm\\_final\\_low\\_.pdf](http://www.slurc.org/uploads/1/6/9/1/16915440/dissertation_mgm_final_low_.pdf)

Mukhija V (2001), 'Enabling Slum Redevelopment in Mumbai: Policy Paradox in Practice' *Housing Studies*, 16:6, 791–806. Retrieved from <http://dx.doi.org/10.1080/02673030120090548>

Mumford, L. (1961), *The city in history: Its origins and transformations and its prospects*. New York: Harcourt, San Diego, New York.

## N

Newman, P. (2017a). 'Decoupling economic growth from fossil fuels'. *Modern Economy*, 8(6), 791.

Newman P (2017b). The rise and rise of the renewable city, *renewable energy and environmental sustainability* 4(2), 1–5.

Newman P, (2016), 'Sustainable urbanization: four stages of infrastructure planning and progress' *Journal of Sustainable Urbanization, Planning and Progress*, 1, 3–10 Retrieved from <http://dx.doi.org/10.18063/JSUPP.2016.01.005>.

Newman, P. (2009). 'Planning and sustainable urban development: linking the green and brown agendas', in *UN Global Report on Human Settlements –2008*, UN-Habitat, Nairobi.

Newman, P. (1999) 'Sustainability and cities: Extending the metabolism model'. *Landscape and Urban Planning*, 44, 219–226.

Newman, P, Beatley, T. & Boyer, H. (2017). *Resilient cities: Overcoming fossil fuel dependence*. (2nd edn) Island Press.

Newman, P. & Kenworthy, J., (1999), *Sustainability and cities*, Island Press, Washington DC.

Ngau, P., Philip, O., Mbilu, J., Mutua, M., & Achieng, J. (2012). *Approaches to informal settlement upgrading in East Africa: The challenge of sustainable up-scaling of informal settlement upgrading*, Proceedings of a Regional Conference, University of Nairobi.

## O

OECD (2011), *Invention and transfer of environmental technologies*, OECD Studies on Environmental Innovation, OECD Publishing. Retrieved from <http://dx.doi.org/10.1787/9789264115620-en>

Okpala, D. C. (1999). Upgrading slum and squatter settlements in developing countries: Is there a cost-effective alternative? *Third World Planning Review*, 21(1), 1.

Oliver, V.C. (2014). The management and delivery of urban infrastructure services. *Ethiopia Urbanization Review Background Paper*, The World Bank.

Overseas Development institute (ODI). (2016.) *10 things to know about progress in international development*, London.

## P

Pahl, G. (2012). *Power from the people: how to organize, finance, and launch local energy projects*. Chelsea Green Publishing.

Parkinson, J. & Tayler, K. (2003), 'Decentralized wastewater management in peri-urban areas in low-income countries', *Environment and Urbanization* 15.

Retrieved from

<http://journals.sagepub.com/doi/abs/10.1177/095624780301500119>

Participatory Upgrading of Informal Areas (PDP) in Egypt, (2010). *A decision-makers' guide for action*. Participatory Development Programme in Urban Areas in Egypt, Cairo.

Patel, S., d'Cruz, C., & Burra, S. (2002). 'Beyond evictions in a global city: people-managed resettlement in Mumbai.' *Environment and Urbanization*, 14(1), 159–172.

Perry, N., Greenhalgh, H., Cong, M. H., Liu, H., & Zhang, Y. (2014). *An exploration of the implementation and sustainability of urban area policies aimed at Millennium Development Goals# 1 and# 7*. Report prepared for the Division for Public Administration and Development Management (DPADM), United Nations Department of Economic and Social Affairs (UNDESA); USC Sol Price School of Public Policy, University of Southern California: Los Angeles, CA. Retrieved from <http://workspace.unpan.org/sites/Internet/Documents/UNPAN93524.pdf>

Private Sector Development Hub/Addis Ababa Chamber of Commerce and Sectoral Associations (2011), *Situation Analysis of Business and Sectoral Associations in Ethiopia*.

Pugh, C. (1991). 'Housing policies and the role of the World Bank.' *Habitat International*, 15(1–2), 275–298.

## R

Rauland V (2013), *Decarbonising cities: Certifying carbon reduction in urban development*, PhD Thesis, Curtin University.

Regassa, B., & Regassa, N. (2015). 'Housing and poverty in Southern Ethiopia: Examining affordability of condominium houses in Hawassa City.' *Economics & Sociology*, 8(3), 155.

Regassa, N., Sundaraa, R. D., & Seboka, B. B. (2011). 'Challenges and opportunities in municipal solid waste management: The case of Addis Ababa city, Central Ethiopia.' *Journal of Human Ecology*, 33(3), 179–190.



Research-inspired Policy and Practice Learning in Ethiopia (2009). *Improving WASH information for better service delivery in Ethiopia*, Addis Ababa.

Restrepo Cadavid, P. (2011). *The impacts of slum policies on households' welfare: The case of Medellin (Colombia) and Mumbai (India)*. *Economies and finances*. Ecole Nationale Supérieure des Mines de Paris.

Richard P & Engelman, R (1997), *Economics and rapid change: The influence of population growth*, *population action international*. Retrieved from [http://pai.org/wp-content/uploads/2012/01/Economics\\_and\\_Rapid\\_Change\\_PDF.pdf](http://pai.org/wp-content/uploads/2012/01/Economics_and_Rapid_Change_PDF.pdf)

RiPPLE. 2009. *Improving WASH Information for Better Service Delivery in Ethiopia: A Summary Working Paper under the Long-term Action Research Theme on Access to WASH services*. Addis Ababa.

Roberts, R. (1971), *The classic slum: Salford life in the first quarter of the century*, Manchester, Manchester University Press.

Rogelj, J., Den Elzen, M., Höhne, N., Fransen, T., Fekete, H., Winkler, H., ... & Meinshausen, M. (2016). Paris Agreement climate proposals need a boost to keep warming well below 2 C. *Nature*, 534(7609), 631–639.

## S

Sachs, J. (2015) *The age of sustainable development*. Columbia University Press: New York.

Sachs, J. (2014) *Sustainable development economics*. Retrieved from <https://www.project-syndicate.org/commentary/promote-sustainable-development-economics-by-jeffrey-d-sachs-2014-11?barrier=accessreg>

Sachs, J.D. (2012). 'From millennium development goals to sustainable development goals'. *The Lancet*, 379(9832), 2206–2211.

Samson, K, (2012), 'Cities as engines of economic growth and transformation in Ethiopia', In Samson, K, Do (eds) *Urban centers matter for growth*, Lesan Printing Press, Addis Ababa, Ethiopia.

Satterthwaite D (2004), 'The under-estimation of urban poverty in low and middle-income nations', *Poverty Reduction in Urban Areas' Series Working Paper 14*, IIED London. Retrieved from <http://pubs.iied.org/pdfs/9322IIED.pdf>

- Satterthwaite, D. (2016). Missing the Millennium Development Goal targets for water and sanitation in urban areas. *Environment and Urbanization*, 28(1), 99–118.
- Satterthwaite, D. (2004). *The under-estimation of urban poverty in low and middle-income nations* (Vol. 14). IIED.
- Satterthwaite, D. (1998), 'Cities and sustainable development: what progress since our common future?' In G.B. Softing, G.B. Kuetil Hindar, L. Wallowe & A. Wijkman (eds) *The Brundtland Commission's Report – 10 years*, Scandinavian University Press, Oslo.
- Schaengold D (2006), *Clean distributed generation for slum electrification: The case of Mumbai*, Discussion paper, Woodrow Wilson School Task Force on Energy for Sustainable Development, Princeton.
- Serneels, P. (2007). 'The nature of unemployment among young men in urban Ethiopia.' *Review of Development Economics*, 11(1), 170–186.
- Siddiqui, F. A., & Newman, P. (2005). 'Grameen Shakti: financing renewable energy in Bangladesh.' *Indian Renewable Energy Development Agency*, 2(1), 31–38
- Silas, J. 1993. *Surabaya 1293–1993: A city of partnership*. Municipal Government of Surabaya.
- Singh, P. & Khosla, R. (2008). *Resettlement of slum dwellers: A handbook for city governments*. Centre for Urban and Regional Planning, New Delhi.
- Sovacool, B.K., & Brown, M.A. (2010). 'Twelve metropolitan carbon footprints: A preliminary comparative global assessment.' *Energy Policy*, 38(9), 4856–4869.
- Stokes, C. J. (1962). 'A theory of slums.' *Land Economics*, 38(3), 187–197.
- Sullivan, W.C., Kuo, F.E., & Depooter, S.F. (2004). The fruit of urban nature: Vital neighborhood spaces. *Environment and Behavior*, 36(5), 678–700.
- Sustainable Development Solutions Network (2013), 'Why the world needs an urban Sustainable Development Goal'. Retrieved from <http://unsdsn.org/wp-content/uploads/2014/02/130918-SDSN-Why-the-World-Needs-an-Urban-SDG-rev-1310291.pdf>

## T

- Takesada, N., Manatunge, J. & Herath I.L. (2008). 'Resettler choices and long-term consequences of involuntary resettlement caused by construction of Kotmale Dam in Sri Lanka. *Lakes and Reservoirs: Research & Management*, 13(3), 245–254.
- Tarekegn, E.A. (2000). *KITIYA – Transformation of Low Income Housing in Addis Ababa*. (PhD thesis) Trondheim: NTNU.
- Teferi, Z. A., & Newman, P. (2018). Slum Upgrading: Can the 1.5° C Carbon Reduction Work with SDGs in these Settlements? *Urban Planning*, 3(2), 52-63.
- Teferi, Z. A and Newman, P., (2017). Slum Regeneration and Sustainability: Applying the Extended Metabolism Model and the SDG's, *Sustainability*. 9(12), 2273.
- Teferi, Z.A., & Newman, P. (2017). 'Improvement of slums in Addis Ababa: Moving towards community-sensitive distributed infrastructure.' *Urbanization*, IIHS (forthcoming).
- Teferi, Z.A. & Newman, P. (2014). *Older slums in Addis Ababa: How do they Work?* 4th International Conference on Informal Urbanism. Proceedings, Cairo, Egypt.
- Teferi, Z.A., Newman, P., & Matan, A (2016). Applying a sustainable development model to informal settlements in Addis Ababa. In: Kerr, T. & Stephens, J. (eds), *Indian Ocean Futures: Communities, Sustainability and Security*. Cambridge Scholars Publishing, UK.
- Terefe, H (2005). *Contested space. Transformation of inner-city market areas, and users' reaction in Addis Ababa, Ethiopia*. (PhD thesis) NTNU, Trondheim.
- Tesfaye, A. (2007) Problems and prospects of housing development in Ethiopia, *Property Management*, 25(1), 27–53.
- Tesfay, M. W. (2016). *The challenges of current urban upgrading projects in Addis Ababa, Ethiopia* (Master's thesis) NTNU, Trondheim.
- Tezera, F. & Neka-Tibeb, H. (2014), *Baseline study of health and nutritional status of underprivileged women and children in Addis Ababa*, WFP Urban Women Fortified Food Facility, Addis Ababa.
- The World Bank, (2015). *Addis Ababa, Ethiopia: Enhancing urban resilience*  
Retrieved from

<http://www.worldbank.org/en/topic/urbandevelopment/publication/addis-ababa-ethiopia-enhancing-urban-resilience>

The World Bank, UNCHS (Habitat) (2013), *Cities Alliances for cities without slums: Action plan for moving slum upgrading to scale: UNDP-World Bank Water and Sanitation Program – South Asia*. New Delhi, India. Retrieved from <http://web.mit.edu/urbanupgrading/sponsor/ActionPlan.pdf>

The World Bank (2012), *Action Plan for Moving Slum Upgrading to Scale: UNDP – World Bank Water and Sanitation Program – South Asia*, New Delhi, India. Retrieved from <http://web.mit.edu/urbanupgrading/sponsor/ActionPlan.pdf>

The World Bank (2000), *Entering the 21st Century, World Development Report 1999–2000*, Oxford University Press, Washington DC.

The World Bank (1993), *Housing enabling markets to work a World Bank policy paper*, Washington, DC.

Thomson, G., Newton, P. & Newman, P. (2016), 'Urban regeneration and urban fabrics in Australian Cities', *Journal of Urban Regeneration and Renewal* 10(2), 169–190. Retrieved from <http://www.ingentaconnect.com/content/hsp/jurr/2017/00000010/00000002/art00007?crawler=true&mimetype=application/pdf>

Thomson, G. & Newman, P. (2017). Urban fabrics and urban metabolism: From sustainable to regenerative cities. *Resources, Conservation and Recycling*.

Thomson, G. & Newman, P. (2016). 'Geoengineering in the anthropocene through regenerative urbanism.' *Geosciences*, 6, 46–61.

Tollin, N., & Hamhaber, J. (2017). 'Sustainable and resilient cities: SDGs, New urban agenda and the Paris Agreement.' *Energia Ambiente e innovazione*, 1, 8.

Tolon, U. W. (2008). *Comparison of urban upgrading projects on development cooperation in Ethiopia*. Universitat Politecnica de Catalunya, BarcelonaTech.

Tolossa, D. (2010). 'Some realities of the urban poor and their food security situations: a case study of Berta Gibi and Gemechu Safar in the city of Addis Ababa, Ethiopia.' *Environment and Urbanization*, 22(1), 179–198.

Trancik, R. (1986). *Finding lost space: Theories of urban design*. John Wiley & Sons, New York.

Triveno, L, (2016), *Eight stubborn facts about housing policies*, *The World Bank*.

Retrieved from

<http://blogs.worldbank.org/sustainablecities/psd/category/tags/slums>

Turley, R., Saith, R., Bhan, N., Rehfuss, E., & Carter, B. (2013). *Slum upgrading strategies involving physical environment and infrastructure interventions and their effects on health and socio-economic outcomes*. Cochrane Data Base (1).

Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/23440845>

Turner, J. F., & Fichter, R. (eds). (1972). *Freedom to build: Dweller control of the housing process*. Macmillan.

## U

UN-Habitat (2016) *World Cities Report 2016: Urbanization and development – emerging features*, United Nations Human Settlements Programme.

UN Habitat, (2015). *Urban infrastructure and basic services, including energy. Habitat III Issue Papers*, New York, N.Y.

UN-Habitat (2014). *Streets as tools for urban transformation in slums: an approach to citywide slum upgrading*. UN-Habitat.

UN-Habitat, (2013). *State of the world's cities 2012/2013: Prosperity of cities*. Routledge.

UN HABITAT, (2011), *Condominium housing in Ethiopia: The Integrated Housing Development Programme*, Nairobi, Kenya.

UN-Habitat, (2011). *Cities and climate change: Global report on human settlements 2011*. London: Earthscan.

UN-Habitat (2010). *The State of African Cities 2010: Governance, inequalities and urban land markets*, UN-Habitat, Nairobi.

UN Habitat (2009) *Planning and Urban Development*, in *UN Global Review of Human Settlements 2008*, United Nations Habitat, Nairobi.

UN Habitat (2007). *What are slums and why do they exist? Global Report on Human Settlements*, United Nations Human Settlements Programme, Nairobi, Kenya.

UN-HABITAT (2007), *Situation analysis of informal settlements in Addis Ababa, Cities without Slums Programme: Addis Ababa Slum Upgrading Programme*. United Nations Human Settlements Programme: Nairobi, Kenya.

UN-Habitat (2007). *Slum upgrading: Framing the issues*. Prepared for CGAP. UN-Habitat.

UN-HABITAT, (2006), *State of the World's Report 2006/7*, Earthscan, United Nations Human Settlements Programme, Nairobi, Kenya.

UN-Habitat, (2006). *Enabling shelter strategies: Review of experiences from two decades of Implementation*. UN-Habitat, Nairobi.

UN-Habitat. (2004). 'The challenge of slums: global report on human settlements 2003.' *Management of Environmental Quality: An International Journal*, 15(3), 337–338.

UN-Habitat (2003b). *The challenge of slums: Global report on human settlements 2003*, Earthscan, London.

UN-Habitat (2003a). *Guide to monitoring Target 11: Improving the lives of 100 million slum dwellers: Progress towards the Millennium Development Goals*, UN-Habitat, Nairobi.

UNDESA, 2014. *World Urbanization Prospects*. United Nations Department of Economic and Social Affairs (UNDESA). Retrieved from <http://esa.un.org/unpd/wup/Highlights/WUP2014-Highlights.pdf>.

Unger, A., & L. W. Riley (2007), 'Slum health: From understanding to action.' *PLOS Medicine*, 4(10), 1561–1566. Retrieved from <http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.0040295>

UNICEF (2010). *Levels and trends in child mortality in Ethiopia*. UNICEF, New York, USA.

United Nations (2016), *The Sustainable Development Goals Report*, New York, USA.

United Nations Human Rights (2004). *Basic principles and guidelines on development-based evictions and displacement*. UN, Switzerland. Retrieved from <http://www.ohchr.org/SP/Issues/Housing/Pages/ForcedEvictions.aspx>

United Nations., (2016), *The Sustainable Development Goals Report 2016*, New York, USA.

United Nations, Department of Economic and Social Affairs, Population Division (2015). *World Population Prospects: The 2015 Revision*. New York: United Nations.

United Nations, Department of Economic and Social Affairs, Population Division (2015), *World Population Prospects: The 2015 Revision, Key Findings and Advance Tables* Working Paper No. ESA/P/WP.241, New York.

United Nations. 2015. Resolution adopted by the General Assembly on 25 September 2015, 17th session. Agenda Items 15 and 116. Retrieved from [http://www.un.org/ga/search/view\\_doc.asp?symbol=A/RES/70/1&Lang=E](http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E).

United Nations, Department of Economic and Social Affairs, Population Division (2014), *World Urbanization Prospects: The 2014 Revision, Highlights* (ST/ESA/SER.A/352), New York.

## **W**

Wagstaff A (2002), 'Poverty and health sector inequalities', *Bulletin of the World Health Organization*.;80(2): 97–105.

Webb, R.; Bai, X.; Smith, M.S.; Costanza, R.; Griggs, D.; Moglia, M.; Neuman, M.; Newman, P.; Newton, P.; Norman, B., et al. (2017) *Sustainable urban systems: Co-design and framing for transformation*. *Ambio*.

Weinstein, L. (2014), *The durable slum—Dharavi and the right to stay put in globalizing Mumbai*. Hyderabad: Orient Blackswan.

Weinstein, L. (2008). Mumbai's development mafias: Globalization, organized crime and land development. *International Journal of Urban and Regional Research*, 32(1), 22–39.

Werlin, H. (1999). 'The slum upgrading myth.' *Urban Studies*, 36(9), 1523–1534.

Williams, B. (2008), 'Hopetoun Infrastructure Study,' Perth: Landcorp, WA Government, in Newman et al, (2017), *Resilient Cities: Overcoming fossil fuel dependence*, Island Press, Washington DC, USA.

- Wollenberg, E., Richards, M., Smith, P., Havlík, P., Obersteiner, M., Tubiello, F. N., & Vuuren, D. P. (2016). 'Reducing emissions from agriculture to meet the 2 C target.' *Global Change Biology*, 22(12), 3859–3864.
- Wolman, A., (1965). 'The metabolism of cities', *Scientific America*, 213(3), 179–190.
- Woolcock, M. 1998. 'Social capital and economic development: Toward a theoretical synthesis and policy framework.' *Theory and Society* 27: 151–208.
- World Bank (2011), *Sustainable economics to end poverty*. London, UK. Retrieved from <http://data.worldbank.org/indicator/NY.GDP.PCAP.CD>
- World Bank, (2006), *Thirty years of World Bank shelter lending: what have we learnt*, Washington DC, USA, 140 pages.
- World Bank (2000), '*Entering the 21st Century*', *World Development Report 1999–2000*, Oxford University Press, Washington DC.
- World Bank (1993), '*Housing enabling markets to work*' A World Bank Policy Paper, Washington, DC.
- World Bank Group (WBG) (2015). *City strength resilient cities program: Addis Ababa, Ethiopia - enhancing urban resilience*; Global Practice on Social, Urban, Rural and Resilience, World Bank Group: Washington DC, 2015. Retrieved from <http://documents.worldbank.org/curated/en/559781468196153638/pdf/100980-REVISED-WP-PUBLIC-Box394816B-Addis-Ababa-CityStrength-ESpread-S.pdf>
- Wubneh, M. (1976). *Spatial dynamics and infrastructure investment: An analysis of the effects of infrastructure on the development of urban areas and locational decisions of firms in Ethiopia*. Retrieved from <https://search-proquest-com.dbgw.lis.curtin.edu.au/docview/302796528?accountid=10382>
- Wubneh, M. (1983). *Spatial Analysis of Urban-Industrial Development in Ethiopia*, Syracuse, New York: Syracuse University
- Wubneh, M. (2013). 'Addis Ababa, Ethiopia – Africa's diplomatic capital.' *Cities* 35: 255–269.



## Y

Yntiso, G (2008). 'Urban development and displacement in Addis Ababa: The impact of resettlement projects on low-income households', *Eastern Africa Social Science Research Review*, 24(2) 53–77

<http://www.rlarrdc.org.in/images/Resettlement%20Projects%20in%20Addiba.pdf>

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