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Modelling the impacts of urban upgrading on population dynamics

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ABSTRACT

Due to the rapid pace of urbanization, cities in the global South are growing with most of this growth occurring in informal settlements. Urban upgrading aims to improve living conditions in such settlements by improving the infrastructure but might lead to unexpected effects such as income segregation. InformalCity, a spatially explicit agent-based model, simulates the implications of urban upgrading in an artificial city. Our simulation experiments show that maintenance of the upgraded infrastructure, the scope of upgrading efforts, and timing (early vs. late investments) affect infrastructure quality, housing development and income segregation. However, we also find that urban upgrading interventions can have contradictory effects; for example, maintenance increases the quality of infrastructure and income segregation. Thus, policy makers need to establish clear targets for upgrading projects, and empirical evaluation studies should consider studying the impacts of urban upgrading on an entire city's development rather than limiting them to informal settlements.

1. Introduction

Most urbanization is currently taking place in the global South, where urban development often occurs in the form of informal settlements (Martínez et al., 2008, UN Habitat, 2009). These areas often have high and increasing population densities and low levels of public infrastructure, which can lead to severe public health problems and a low quality of life for their inhabitants. Urban upgrading is often considered as a policy option and implemented to improve living conditions in these areas (Satterthwaite, 2012). It encompasses a variety of measures to improve the quality of housing and the provision of infrastructures and services to settlements at the neighbourhood level, be it informal settlements, slums or other types of settlements (Davidson and Payne, 2000). Despite the many benefits provided by urban upgrading, such interventions might also have unintended negative effects such as increased income segregation within a city or rising living costs (studies summarized in Turley et al., 2013). In addition, urban upgrading might create a vicious cycle in which the greater attractiveness of upgraded settlements gives rise to increased in-migration and thus worsens living conditions (Huchzermeyer, 2008).

Evaluations investigating the effects of upgrading interventions to learn from successes and failures have been completed, for example, on behalf of funding agencies (e.g., I.T. Transport Ltd., 2005) and by independent researchers (e.g., Patel, 2013). Traditional approaches to evaluate interventions of urban upgrading focus on the settlement or neighbourhood scale to analyse the effects of the upgrading efforts on living conditions in the target area. Thus, most evaluations of upgrading do not consider its effects on other parts of the city, even though a "settlement cannot be isolated from the city of which it is a part" (Abbott, 2002a; page 308). Evaluations focussing only on the upgraded area fall short when it comes to systematically detecting the effects of the intervention on other parts of the city. Moreover, Gulyani and Bassett (2007, page 488) argue that upgrading has "to go 'to scale'", meaning that upgrading should not focus only on individual settlements, but rather consider the whole city, to provide broader and sustainable benefits. Therefore, it is necessary to widen the scope of evaluations of urban upgrading to the city scale. Many aspects change as a result of urban upgrading, and this paper shows one example of studying such changes at a citywide scale. In this paper, we aim to understand the effects of improved infrastructure provision on residential mobility and the resulting spatial patterns of population distribution. This enhanced understanding could be used to design well-informed upgrading policies and could also support more critical discussions about not only the direct but also the indirect

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impacts of urban upgrading. Our model design is informed by primary surveys, personal observations and discussions with planners and residents in numerous settlements, in addition to studies conducted in informal settlements in Sub-Saharan Africa (SSA) over recent decades (see for example Sheuya, 2004, Sliuzas, 2004, Young and Flacke, 2010 for some background on informal settlement growth in SSA and Dar es Salaam in particular).

1.1. Urban informal growth in SSA

SSA experiences an unprecedented urbanization process over the last 40 years as a result of the inherent demographic processes of natural population growth and rural-urban migration. Simultaneously, many SSA countries have experienced prolonged economic decline, particularly in the 1980s and 1990s, and political instability, and their weak statutory planning systems have exacerbated the problems associated with rapid urbanization (Kombe and Kreibich, 2000). This situation has led to majority of the urban population, especially the urban poor, living in informal conditions, in terms of both housing and employment. Recent figures estimate that approximately 62% of the urban population in Sub-Saharan Africa lives in slums (UN Habitat, 2012).

Urban informal settlements in SSA can generally be defined by two basic characteristics: First, the housing is illegally built and second, few services and community facilities are available in the immediate neighbourhood (Sheuya, 2009). Sliuzas (2004) describes the growth process of these settlements as a gradual incremental process of individual land transactions between traditional (rural) land owners and households seeking to build a new house in the city or in the urban fringe. Though the resulting urban patterns often seem to be spontaneously developed and disordered, they are influenced by a number of physical, economic, and cultural factors, such as site quality in terms of slope and hazards, location and land value, and social networks and kinship ties (Sliuzas, 1988). Nevertheless, these settlements generally have less orderly spatial structures than planned neighbourhoods.

1.2. Urban upgrading

Upgrading interventions comprise a variety of measures, ranging from minor (e.g., paved roads) to major improvements, including legal tenure (Satterthwaite, 2012). Gulyani and Bassett (2007) describe a trajectory of upgrading projects in SSA from first generation projects in the early 1970s, which focused on providing large quantities of affordable housing units, to second generation projects beginning in the 1990s, which included interventions to legalize land tenure, create physical plans, resettle residents, and develop technical infrastructure. Minnery et al. (2013) distinguish a hierarchy of urban upgrading elements from (a) basic physical services, (b) private consolidation (shelter upgrading), and (c) public consolidation to (d) institutional reform. The focus of this study is on the first level of basic physical infrastructure on the neighbourhood or settlement scale. This level includes providing water pipes, sewers, drains, paved roads, footpaths and electricity. Whereas urban upgrading driven by household investments mostly aims at improving housing quality, neighbourhood-wide physical infrastructure is often targeted by community or resident organisations, local governments, and/or external funding organizations (Satterthwaite, 2012). Improvements in public investment are believed to provide a stimulus for private household investments. Apart from immediate increases in housing and infrastructure quality, urban upgrading may also aim towards poverty alleviation, reduction of vulnerability and social integration, both within a settlement and within the city (Abbott, 2002b).

Urban upgrading programmes focussing on physical infrastructure are diverse and can be characterised with respect to the following four configuration parameters: maintenance of the implemented interventions, scope of upgrading, selection of target districts, and cost recovery.

1.2.1. Maintenance

Past upgrading programmes have often been criticised over a lack of provision of maintenance of the physical infrastructure (Satterthwaite, 2012). Patel (2013) shows that for a settlement in Durban, South-Africa, substantial participation of the community in the upgrading process is essential for sustainable success of the implemented interventions.

1.2.2. Scope of upgrading

The scope of an upgrading programme has important social and economic consequences. On the one hand, comprehensive upgrading programmes that also include social services increase costs for the targeted community (Satterthwaite, 2012). Thus, if looking at an entire urban region with limited resources, fewer settlements can be targeted. On the other hand, some upgrading programmes, such as the Kampong Improvement Programme in Indonesia, aim to reach a large number of settlements, but with a lower standard of improvement (Satterthwaite, 2012). Thus, given limited resources, the scope of upgrading interventions lies on a continuum between either higher quality improvements for fewer communities or lower quality improvements for more communities. A quantity-quality trade-off is to be considered in all urban upgrading programmes.

1.2.3. Selection of target districts

Regarding the selection of target districts for upgrading, Huchzermeyer (1999, as cited in Abbott, 2002a) distinguishes between two types of interventions: externally designed comprehensive upgrading and support-based interventions. For example, community-based initiatives aimed at building the capacity of the poor to improve their own housing are often found on the Indian sub-continent, whereas in Latin and Central America, settlement master plans are often developed by combining different data sources in geographical information systems (Abbott, 2002a). When considering an entire urban region, the question of “which settlements are to be upgraded?” arises. For community-based efforts, upgrading initiatives may evolve where the presence of strong community leaders drive community upgrading processes rather than where the needs are greatest (Minnery et al., 2013). By contrast, in top-down upgrading programmes that are strongly steered by external funding or national governments, communities may be chosen according to a city-wide needs assessment or even be biased by political expediency.

1.2.4. Cost recovery

Many early upgrading efforts were top-down (Minnery et al., 2013), dominated by externally funded upgrading programmes that did not implement cost recovery from households (Satterthwaite, 2012). Currently, the financial resources for urban upgrading often stem from a combination of contributions, including national, local government and community support. Community support means that residents also have to commit themselves to covering a substantial portion of the costs (Satterthwaite, 2012). However, an evaluation of a number of upgrading projects in SSA showed that in practice, cost recovery from beneficiaries has been problematic in many cases due to residents’ unwillingness to pay or because of a poor project design and hence undesirable or unaffordable project outcomes for the beneficiaries (Gulyani and Bassett, 2007).