別紙４－１（課程博士（英文））

Date of Submission (month day, year) : July 6th, 2021

Department of Architecture and Civil Engineering	Student ID Number	D189504	Supervisors	Prof. Asano Junichiro Prof. Hiroyuki Shibusawa Prof. Shiro Matsushima
Applicant's name	UWAMAHORO ADRIEN			

Abstract (Doctor)

Title of Thesis	A Study on Informal Settlements Upgrading Approach with Viewpoint of Sustainable Community in Developing Country.

Approx. 800 words

Informal settlements, hereinafter referred to IS, have become integral in the forms of urbanization across the global south. Types and extents of urban informality vary according to contextual socio-economic scenarios. In Rwanda, IS emerged in and around the capital City of Kigali since its creation early 20th century, due to natural growth and the flux of rural-urban migration. Apart from the capital city, other Rwandan cities, towns and centers grew randomly without short and/or long-term physical plans. Informal dwellings differ greatly in sizes, age and character and do not conform to zoning and service regulations. Notwithstanding their variations, however, these dwellings share similar morphological as well socio-economic problems.

By the year 2007, the Rwanda government officially launched a so-called "Kigali City Master Plan". Concerning the IS chapter, the master plan suggests two approaches, namely: the on-site upgrading and total relocation. The Government of Rwanda, through its Ministry of Infrastructure and the Rwanda Housing Authority and in collaboration with private investors, adopted different countermeasures aiming at alleviating further proliferation of IS by onsite upgrading on one hand, and by total relocation and resettlement on the other hand . The Government is ambitious at orienting the urbanization process of the country in a planned and organized manner, to ensure future urban growth and development centered at addressing the above challenges. To achieve this goal, a number of initiatives are into process including, but not limited to, the following: (1) Elaboration and implementation of urban planning and development tools such as: conceptual and detailed physical master plans, local urban development plans, sector specific plans and layout plans. (2) Informal settlement upgrading strategies. (3) Development of secondary cities.
In order to alleviate the pressure on the capital city, thereby achieving a sustainable urbanization growth rate, the Government collaborated with the World Bank and selected six cities, throughout the country, to become the poles of economic growth and development by equipping them with pulling infrastructures and services that attract people to the capital city.

This research focuses on the on-site upgrading of informal settlements as a sustainable solution that leaves intact the residents' socio-economic long-lasting networks.

Previous researches on this topic do exist, but there are still gaps in clear guidelines of best upgrading practices. We highlighted the socio-economic clustering formations by assessing the interrelationships among dwellings typologies with available public infrastructures, utilities and services. The unique approach of this research bases on the examination and analysis of methodically collected metric data that enables to formulate scientific-based evidences of the existing conditions, their inter-dependency relationships as well their hierarchies towards a sustainable response.

To carry out this research, we collected metric data on predefined socio-economic and demographic indicators from two different informal settlements sites. By combining the on-site surveys, self-observations and interviews, we assembled required data to fulfill our research focus on IS communities levels. Furthermore, for a better understanding on Kigali city's and Rwanda position among other cities and countries with comparable conditions, we relied on the open-source data from the World Bank's annual compilation and ranking of world's countries on socio-economic and demographic indicators.

In order to alleviate the gaps in information for onsite informal settlement upgrading, we designed this study to address answers to main questions about hierarchical clustering among households, their cause and their relationships with existing public infrastructure, services and utilities. We also crosschecked the concerned IS communities standards of living with the minima recommended by the United Nations organizations like the World Health Organization, UN-habitat and the United Nation Development Program.

Our simplistic exploratory data exercise has shown that cities with slums cluster among themselves mostly with respect to the countries income levels. Concerning the study precincts, hierarchies do exist among the households, whereby they sort into clusters groups with respect to their socio-economic standpoints, expressed by the differences in levels of housing quality as well as the accessibility to public infrastructures, utilities and services. According to UN-Habitat's indicators and thresholds for defining slums and informal settlements, our findings from data analysis showed that, for each study precinct, slums hold about one third of total households. The slums share in the study precincts is almost half the rate of the overall Kigali city's slums; this makes a strength for the precinct's on-site upgradability, as fewer dwellings will have to be replaced. Referring to the World Health Organization recommended standards for minimum levels of health and hygiene, more than half of both precincts dwellers fall under the bottom line of recommended minima for basic sanitation services.

The findings from this research will enlighten the implementers of the on-site upgrading projects to prepare adequate physical plans responding to the needs of informal dwellers on one hand, and their integration to the overall city fabric. Furthermore, the findings will redound to developing world cities' informal settlements and slums upgrading efforts; considering that it will contribute to a better understanding of their inner challenges.

Key words: informal settlements, on-site upgrading, relocation, building typologies, hierarchical clustering, essential functions, Sustainable Development Goals