

Effects of Retrofitting and Re-Strengthening of Buildings in Kabul City Land Use and Master Plan

RAHIMULLAH HABIBZAI, MITSUHIRO SHIGEISHI

Department of Civil and Environmental Engineering, Kumamoto University, Japan

Email: rmukhless@yahoo.com, shigeishi@civil.kumamoto-u.ac.jp

Abstract: Kabul is the capital of Afghanistan and the fifth fastest growing city in the world. As an unwanted consequence of this growth, 70% of Kabul citizens are living in unplanned inhabitant areas. Currently, around three million people are living in unplanned residential areas, which lack vital infrastructure in both material and social terms. This review-paper focuses on effects of retrofitting and re-strengthening on structural plan and land use plan of Kabul. Most buildings in these areas are vulnerable to natural or man-made disasters. Re-strengthening and retrofitting old buildings would be not only result in cost savings but also in a better strategy of land adjustment. Furthermore, such efforts would help to achieve objectives for creating a sustainable city. The best option for realization of optimal land-use policy and mitigation of congestion in Kabul is the distribution of urban cores, or multi-centralization, and redistribution of the population. Re-strengthening and retrofitting buildings would also improve the economic situation of both government and landlords.

Keywords: *Kabul Master Plan, Retrofitting of Buildings, Re-Strengthening of Buildings, Land use in Kabul City, Structure Rehabilitation*

Introduction:

Kabul, located in eastern Afghanistan, is both the capital and largest city of the Islamic Republic of Afghanistan. The city's population was estimated at around 4.8 million in 2012 and approximately 5 million in 2015. It is the 64th largest and the 5th fastest growing city in the world^[2] Fundamental social problems of Kabul are primarily congestion, settlement of inhabitants in unplanned areas, air pollution, insufficient housing, and unsustainability. Buildings constructed in the past without consideration of codes and proper design detail have grown vulnerable and finally must be destroyed as it is difficult to re-build such structures. Most Kabul residents of derelict buildings prefer to rent houses or apartments rather than rebuild. Existing solutions include proper maintenance and inspection of buildings and their re-strengthening and retrofitting when necessary; replacing low-rise and court-housing with high-rise buildings; creation of more diffuse distribution of urban cores in Kabul metropolitan area; ensuring equal facilities and opportunities in each urban core; and rehousing inhabitants from unplanned residential areas to planned areas. Among these, however, proper maintenance, inspection, and re-strengthening of existing structures would not only create a sustainable city but also alleviate the necessity of destroying historical buildings. This solution is mainly limited by lack of knowledge, materials and skilled labours. Economic and construction planning thus must consider feasibility, trends, and techniques.

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Rehabilitation of Buildings

Inspection and maintenance are initial Steps towards re-strengthening and retrofitting of buildings. This is performed through all times by responsible designers, contractors and owners to check that the existing structures behave as intended and are not vulnerable to

aggressive factors. Health assessment and structural inspection of existing structures determine whether their functionality is similar to what is desired and acceptable. Such inspections must be performed once every 5 years for buildings aged between 15 to 30 years and every 3 years for buildings aged over 30 years. Relevant non-destructive tests which do not modify original structural properties are performed for inspection.^[3] In some cases, it is also possible to check the quality of workmanship and structural integrity by the ability to detect voids, cracking, and delamination.^[4] Also, providing frames to buildings with no structural framing increases lateral strength in one or both directions by reinforcement or by increasing wall areas or the number of walls and columns.



Figure 1- A view of dense area in Kabul city

Existing Land use in Kabul City:

Built-up areas occupy 24.0% of the total city area, agricultural land and greenery areas 18.1%, undeveloped and bare land 52.0%, and water bodies 0.55%. A map of existing land use was prepared mostly through interpretation of satellite imageries, combined with available geographic information.^[1]

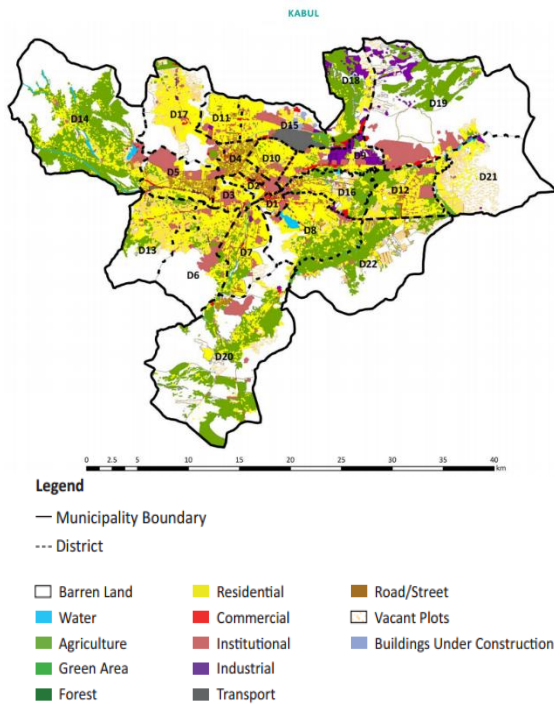


Figure 2. Current Land Use of Kabul Municipality by Broad Category

Distribution of core urban functions:

In an effort to determine urban functions to be located in the proposed expansion of Kabul and those to be strengthened in the existing city, referable locations of different urban utilities are studied first in general positions. Urban functions are mostly broken down, and preferable locations of each function are assessed between the city centre, sub-centres and outer areas. [1]

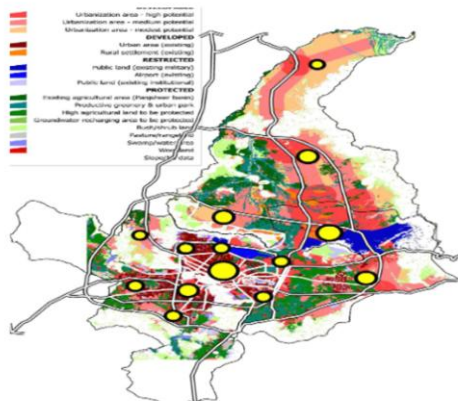


Figure 3. Distribution of core urban centre to multi-core centres.

Results:

Retrofitting and re-strengthening are highly recommended for aged buildings showing signs of deterioration to save human lives from failures. Implementing such projects will help in alleviating environmental pollution, destruction of aged buildings, and land-use issues. Sustainability and logical urban planning can be realized, while housing and life style standards will increase. The economic situation of the stakeholders, both government and land owners, will improve.

Discussion:

Skilled Labour Availability:

Retrofitting practices requires unusual construction methods, is highly technical, and calls for utmost care to implement.

Importance Level Aspect:

Historic buildings with immense archaeological importance are sometimes beyond the cost factor for retrofitting. Such structures have to be rehabilitated without changing their appearance.

Economic Aspect:

The entire cost of construction has to be practical and logical towards extended life of the structure.

Structural Safety Aspect:

The vulnerability of the structure to an earthquake event has to be within acceptable standards.

Conclusion:

The urban development and sustainability of Kabul through retrofitting and re-strengthening old and vulnerable buildings has been recognized as a process mutually benefiting both landowners and government. Historical buildings will remain sound, offering a positive impact on cultural aspects of the city. There would be enough space for green areas, parks, factories, recreational areas and industries that not only will help in mitigation of environmental pollution, a notable problem now in Kabul, but will

Be helpful in achieving a sustainable city in future. Lifestyle standards will change for the better as people are able to efficiently use their lands. By distributing urban cores in Kabul metropolitan areas and providing equal facilities and opportunities, the density of people and congestion will decrease up to suitable levels. Considering high-rise buildings according to update building and design codes on behalf of low-rise buildings or court-yard houses could mitigate the problem of housing and land-demand. Transfer of inhabitants living in unplanned areas to planned residential areas where equal facilities and opportunities are provided by the government will result in better landscape, a clean environment, sustainable development, and easy access to every part of the area.

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