

ACCESSIBILITY ANALYSIS OF THE URBAN FACILITIES IN KABUL CITY BASED ON CITY PLANNING STANDARD

PART 1 (EDUCATION FACILITIES AND RESIDENTIAL AREAS)

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Abstract— In this study, we researched about: Where do the education facilities are located within the city of Kabul. Next, defined the access and accessibility for each individual one of them respectively by taking into consideration of the city planning standards of the Islamic Republic of Afghanistan. Next, analyze the accessibility rate to the education facilities within the municipal boundary of Kabul city in different scales and levels. In the first level of the study we looked at the accessibility rate to the existing facilities within the municipal boundary as a whole. Then, goes one step down and focused on the accessibility rate in the residential and non-residential areas of the city. Finally, to find the answer to the question that do really the facilities are fairly distributing in the city we go one more level down and looked at the accessibility rate in the formal residential and informal residential areas of the city respectively. In other words, in the last step we tried to find how fair do the existing education facilities are distributing in the residential areas in Kabul city.

The study has been undertaken based on the analysis of the geo-spatial data, through ArcGIS and Microsoft Excel software.

In short, the result of study revealed that the education facilities are currently unfairly distributing in Kabul city.

Based on our calculation the accessibility rate to the education facilities within the municipal boundary of Kabul city is as low as 19%. In the residential areas this number increases to about 58%. Our study also showed that most of the residential areas that currently have access to the education facilities are the formal areas of the city where the accessibility rate in formal areas were calculated as 74% while this number decreased to as low as 50% for the informal residential areas of the city.

Index Terms—Education Facilities, Formal Residential Areas, Kabul, Informal Residential Areas

I. INTRODUCTION

Kabul is the capital and the largest city in Afghanistan. [1]-[2]-[3] It is located at the eastern part and currently is considered to be the most important city in the country. Sporadically reports estimated the population of the city to be somehow around 4.7 million people respectively. [1] Most of them are the newcomers who newly migrated to the city after 2001 as a result of the substantial stability that came along—especially to the capital; Kabul—by the military intervention of the United States and its allies back in same year. [4] The

intervention which subsequently resulted in the dethroning of the Taliban regime and the installment of the new government which was backed by the United States and indeed the strong International support. This fact very soon visualized itself through the massive repatriation of the Afghan refugees from all around the world. [4] Hundreds of thousands of the Afghans returned afterward where most of them due to the specific way of life that had experienced through the years of the exile preferred to settle in the cities and urban areas of the country. [4] As a result, the housing demand in the cities shook by an unprecedented scale and the market prices for the land and the housing increased to an unbelievable level. Consequently, and quite for sure predictably again as same as many other problems the low-income families who were not ready for this immediate change had to deal with the negative consequences of this phenomenon to the most. If to be honest, at the time, they had no other option than to give their place to the wealthier families—who are mostly coming from abroad and had considerably better economic situation—and settle in the cheaper areas of the city. Thus, soon many places within the Kabul city started to occupy informally where most of them occupied by the same low-income families who were pushing away from the core and the central parts of the city every day. This process actually repeated times and times again in a very short period of time. In reality what was happening was that the existing land-uses of the city completely lost its importance for the citizens at the time. The land-use transformation was happening so fast and under a very simple rule; any places that could provide cheaper shelter for the citizens had to change to residential purposes regardless of what it was previously using for whether it was agriculture land, public land, governmental land or any other land-uses. As a result, in blink of an eye the boundary of the Kabul city widens enormously and the citizens themselves attached tens of kilometers of the new land to the existing city where for much of these areas there were actually no any official plan (Master Plan) to be referenced to by the responsible organizations in order to regulate or control the citizen's developments. [2] This massive urbanization happened so fast and out of control that had lots of negative

consequences which greatly affected the quality of life of the Kabul's citizens afterwards—specially the informal residential areas of the city. Now, after around two decades of this massive change most of the stakeholders—that as per official reports are forming about 69 percent of the city—are living in the informal areas of the city with the very limited number of accessible facilities. This fact is as much clear and obvious that in most of the cases it is an accepted reality within the existing communities that the amount of the facilities in the formal areas of the city is much more than the informal areas. But, unfortunately, to date there are no any solid effort to be taken on the matter to bring this important issue under the investigation and research. Thus, despite the fact that it is mostly accepted within the existing communities but there is no real proof to quantitatively and for sure academically claim that the amount of the facilities in the formal areas of the city exceeding than the amount of facilities in the informal areas. Hence, in this study we are going to investigate do really the access to the education facilities in the formal areas of the Kabul is more than the informal areas or no. If so, find a way to scale the differences quantitatively.

II. AIM AND PURPOSE

The aim and purpose of this study is to find how the education facilities are distributing in the Kabul city. Next, investigate, the accessibility rate to the education facilities in different level and scales from the city-level to the residential-level and even the sub-residential levels inside the city. In this study we are going to also find do the formal areas of the city have better situation in accessing the education facilities than the informal residential areas or no. If they do find how much is the difference between them in this case.

III. RESEARCH METHODOLOGY

This study is done based on a 3-stage methodology: 1-Data collection, 2-Analysis, and 3- Presentation of Result.

A. Stage 1: Data Collection

In this stage, we collected the necessary data and information from the different sources. In general, the collected data can be categorized into two categories of the land-use data and the facility data.

1) The Land-use Data

The land-use data that hereinafter in this study will be refers by the term 'Kabul Existing Land-Use Layer' as the name indicates were subsequently those data that provide information regarding the existing land-uses in Kabul city e.g. residential areas, non-residential areas, and type of residential areas. For this study, we could successfully collect a geodatabase from the Ministry of Urban Development and Land of Afghanistan (MUDL).

a) MUDL Land-Use Layer

MUDL land-use layer is a term that we used to describe the first geodatabase that we kindly received from the MUDL. It is important to mention that the file has been prepared by the MUDL. It subsequently covers about 812.9 square kilometer of

land of the Kabul municipality area and has divided the city into eighteen different categories of land-uses. Hereinafter in this study we will refer this layer by the term 'MUDL Land-Use Layer'. [5]

This layer is one of the most important layers of the study wherein the residential land-uses of the city are categorized under the two categories of: 1-Formal residential areas, and 2- Informal residential areas. (Fig.1)

This categorization is important because it will subsequently make it possible to precisely scale the differences between the formal and informal residential areas of the city in accessing the existing education facilities.

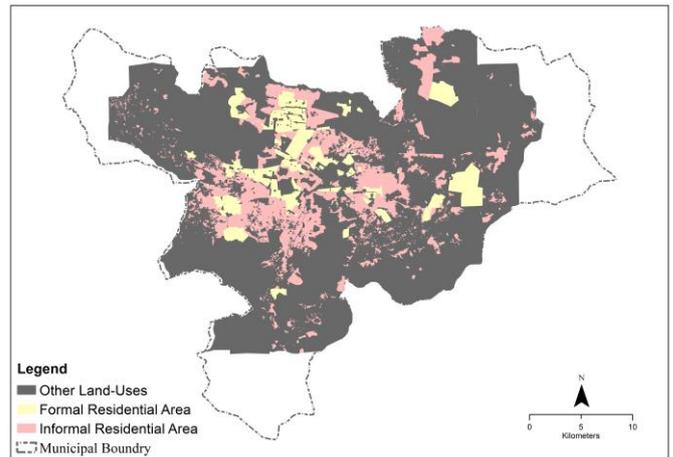


Fig. 1. MUDL Land-Use Layer

2) The Facility Data

By the term of the facility data in this study we mean those collected data that provide us with the information regarding the education facilities of Kabul city e.g. geospatial data regarding existing education facilities or the city planning standard to define the radius of accessibility. The collected data and information in this regard can be subsequently divided into two categories of the geospatial data or the city planning data.

a) Geospatial Data

By the term of geospatial data, we mean those data and information that provide us with the information regarding the location or spatial characteristic of the existing education facilities e.g. location, size, lot shape, etc.

geospatial data and information of the existing education facilities in Kabul city for this study were extracted from the following data and sources:

- Kabul existing land-uses layers received from the MUDL
- Online mapping services (google map, google earth, open street map and etc.)

In this process we could successfully specify the geographical location of 368 education facilities within the Kabul city. (Fig.3)

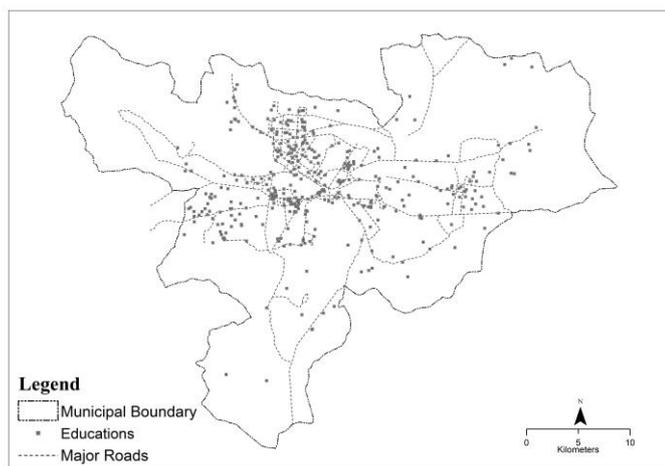


Fig. 2. Study Area and Specified Education Facilities

b) City Planning Data

In order to define the access and accessibility for our study we subsequently needed to collect the data and information regarding the city planning standard. For this purpose, we could successfully collect a document from the respected MUDL as a .pdf file. [6] This document subsequently had been used in this study as a city planning standard source for defining the radius of accessibilities for the education facilities. It is prepared in the Dari language—which is one of the formal languages in Afghanistan. Based on the English translation of the cover page we can name the document as: “The draft of Ministry of Urban Development and Housing’s guideline for the preparation of the detailed urban plans”.

In this particular document the radius of accessibility for each type of facility were defined specifically. Thus, accordingly we used the document as the source for defining the radius of accessibility for each individual education facility that we could previously found through the process of data collection.

Hereinafter in this study this document will be referred as “City Planning Standard”.

B. Stage 2: Analysis

Analysis in this study is the process of the manipulation of the geospatial collected data and information and the city planning standard through ArcGIS software. Thus, accordingly we first defined the access and accessibility for our study. Then goes on and defined the radius of accessibility for each particular existing education facilities which is involved in the study by the help of ArcGIS software. The result was the education facility layer. And finally took the intersection between the land-use layers and the facility layers in ArcGIS software made us able to precisely scale the accessibility rate to education facilities in residential and non-residential areas of the Kabul city. Most importantly this action made it possible to calculate the accessibility rate in the formal residential and the informal residential areas of Kabul city as well. Actually, this

was the most important question that we were hardly looking to find the proper answer to by this study.

1) Define the Access and Accessibility

Access or accessibility in this study means to be located within the geographical location away from the facility to the extent that is subsequently defined by the city planning standard. In other words, the accessibility in our study simply means to be located within the radius of accessibility of each education facility.

2) Education Facility Layer

Education facility layer is the result of combination of the spatial characteristics of the specified education facilities of the study and the city planning standard. For this purpose, in the first step the existing education facilities were divided into two categories of district-level and neighborhood-level based on their types. Thus, accordingly the Universities in this study are assigned as the district-level services and the radius for them is defined as 2,000 meters. Other education facilities e.g. elementary schools, junior schools and etc. are assigned as the neighborhood-level facilities and the radius of accessibility for them was defined as 500 meters respectively.

It is noteworthy to mention that in the city planning standard document that we received from MUDL there were no exact definition for the radius of accessibility of the universities—in contrast to other types of education facilities—and the instruction were only made in case of the preferred location. Thus, the radius of 2,000 meter is defined based on the subjective analysis of the authors.

Next, the radius of accessibility is defined for each particular specified education facility in the study accordingly based on the city planning standard document. (Fig.4)

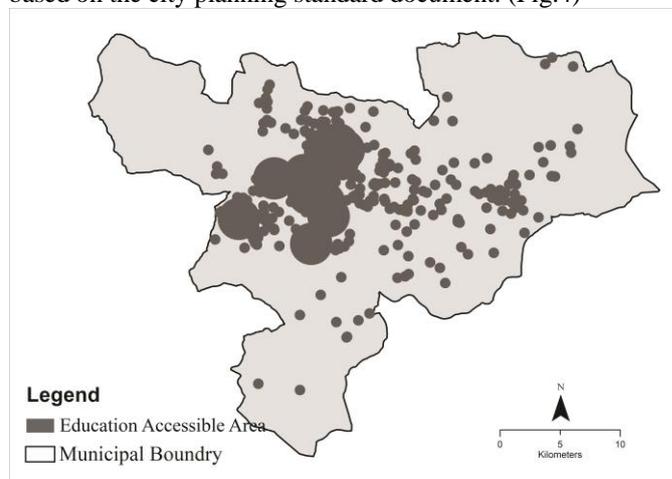


Fig. 3. Education Facility Layer

C. Stage 3: Presentation of The Result

The results in our study are the direct outcome of the analysis and they will be later presented either in case of the maps, or tables and charts. Actually, those results that need to be graphically presented were sent back to the ArcGIS software for the mapping and graphical presentation, others are

organized and presented in case of the tables or charts, by the help of Microsoft Excel software.

IV. EXISTING SITUATION

A. Existing Residential Situation

If evaluate the existing residential areas of the Kabul city according to the MUDL Land-Use Layer thus the residential areas cover about 20,248 hectares of land in Kabul city that account for about 25 percent of the MUDL Land-Use Layer. From these a considerable share, goes to the informal settlers where they account for the 69 percent of the total residential areas. (Table-1)

TABLE I. TABLE-1 KABUL FORMAL/INFORMAL RESIDENTIAL AREAS (MUDL LAND-USE LAYER)

MUDL Land-Use Layer		
Land-Use Category	Area (ha)	Percentage
Formal Residential Area	6,308	31%
Informal Residential Area	13,940	69%
Total	20,248	100%

B. Existing Situation Regarding Education Facilities

In the very first step to analyze how the education facilities are spreading over the Kabul city we prepared the density map by the help of ArcGIS software. In this particular map which is shown in Figure-5 one-kilometer radius is assigned to each specific individual education facility regardless of their type, importance level or any other criteria. A quick grasp on this map shows that the education facilities are currently mostly concentrated on the central and the western part of the Kabul city. (Fig.5)

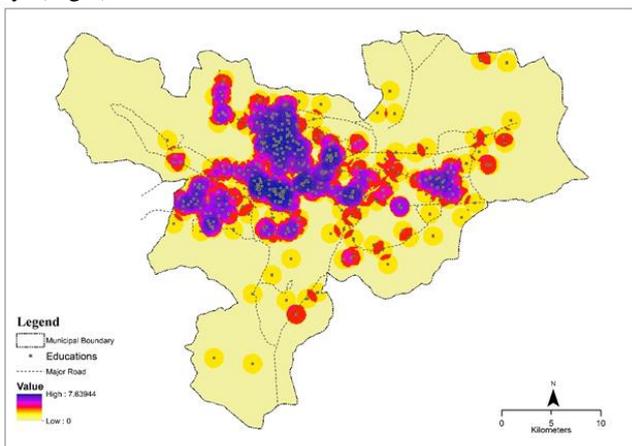


Fig. 4. Density Map of Education Facilities

V. EDUCATION ACCESSIBILITY RATE

A. Education Accessibility Rate in Kabul City

If to evaluate the whole city of Kabul based on the accessibility to the education facilities from the city planning

standard point of view, we can say that about 19,991 hectares of land in the Kabul city currently fall in the accessible areas of the education facilities. This means that the accessibility rate to the education facilities in the city is somehow around 19%.

But as it is quite clear and for sure logical that not all the areas of the city are currently held for the residential purposes thus to exactly find how well do the residential areas are currently being provided with the education facilities, we took an intersection between the facility layer and the existing land-use layer. As a result of this action we were able to exactly and precisely calculate the accessibility rate to the education facilities in formal areas, informal areas, or even non-residential areas of the city respectively.

B. Education Accessibility Rate in Residential Areas

Intersection between the MUDL land-use layer and the education facility layer by ArcGIS software subsequently revealed that from the total residential areas (20,248 hectares) about 11,666 hectares of them currently are located within the radius of accessibility that city planning standard defined for the education facilities respectively. This means that the accessibility rate to the education facilities in residential areas of Kabul city is around 58%.

By taking into consideration of the fact that the residential areas were consist to the both categories of formal and informal areas and these two were distinctly separated by the MUDL land-use layer thus, the previous intersection not only provide us with the information about the accessibility rate in residential areas but more importantly it also made it possible to calculate the precise and exact accessibility rate in the formal and informal areas of the city too.

1) Education Accessibility Rate in Formal Residential Areas

An intersection between the MUDL land-use layer and the facility layer revealed that from the total formal residential areas (6,308 hectares) about 4,675 hectares of them are currently have access to the education facilities.

This means that the accessibility rate to the education facilities in the formal residential areas of the city is about 74% which could be a satisfactory range. As it is illustrated in Figure-6 most of them are the areas that are located in the central and the western part of the city. On the other hand, about 1,633 hectares of the formal residential areas are located outside the accessible areas of the education facilities in Kabul city. These areas are subsequently clearly shown in Figure-6 by light purple color. (Fig.6)

2) Education Accessibility Rate in Informal Areas

Intersection between the MUDL land-use layer and the education facility layer also revealed that from the total informal residential areas (13,940 hectares) about 6,991 hectares of them are located within the accessible areas of the education facilities in Kabul city. Thus, now we can claim that the accessibility rate to the education facilities in the informal areas of the city is about 50%. As it is illustrated in the Figure-7 these areas are again mostly those which are located in the central and the western part of the city. (Fig.7)

Meanwhile about 7,249 hectares of the informal areas in the city are currently deprived of access to the education facilities within the accessibility range that is defined for the education services under the city planning standard of Afghanistan. These areas are shown by the dark yellow color in the Figure-7.

These results subsequently showed that the ongoing belief in the community was quite right and the accessibility rate to the education facilities in the formal areas of the city is more than the informal areas. Now, based on the result of our study we can claim that the accessibility rate in the formal residential areas of the city is somehow about 1.5 times more than the informal residential areas. Thus, we can say that in case of the education facilities the differences in accessing the facility education between the two—formal residential areas and informal residential areas—is not too much.

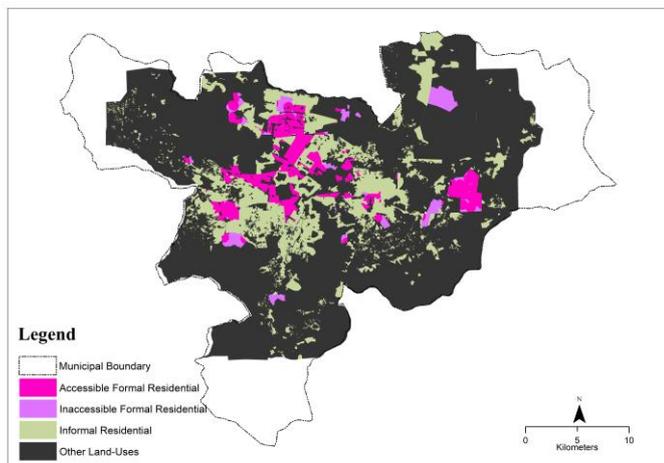


Fig. 5. Formal Residential Areas and Access to Education Facilities

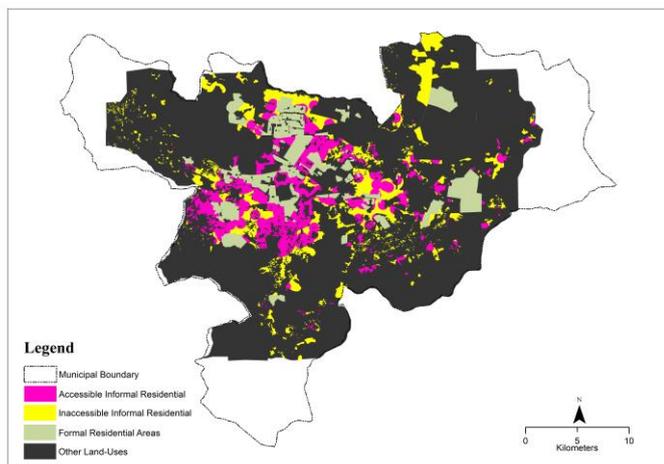


Fig. 6. Informal Residential Areas and Access to Education Facilities

C. Education Accessibility Rate in Non-Residential Areas

Our calculation also showed that from the all non-residential areas of the city (61,042 hectares) about 8,325 hectares of them have currently access to the education

facilities. This means that the accessibility rate to the education facilities in the non-residential areas of the city dropped to as low as 14% only. This fact is clearly shown in Figure-8. (Fig.8)

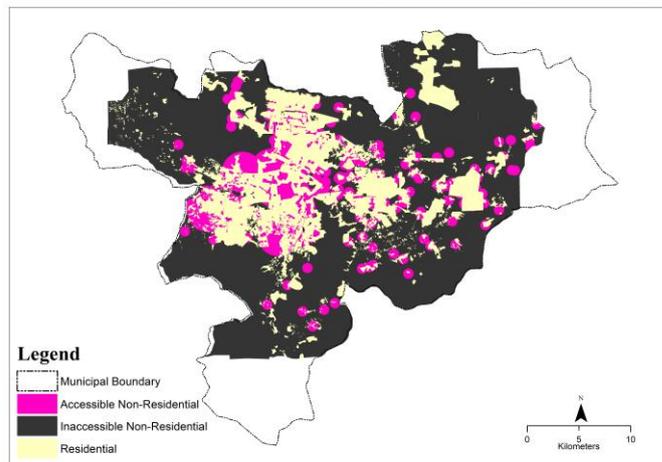


Fig. 7. Non-Residential Areas and Access to Education Facilities in Kabul City

VI. CONCLUSION

The present study was designed to determine the distribution of the existing education facilities in Kabul city. It was undertaken to find do really the education facilities are currently unfairly distributed in the city of Kabul where the formal residential areas have access to more amount of the facilities than the informal residential areas or no. If they do, find a way to quantitatively scale the differences.

To answer these questions, we can now claim that in case of the first question our study finds out that the education facilities are currently mostly concentrated in the central and western part of the Kabul city. In case of the second question we can claim that currently the amount of access to education facilities in the formal residential areas is more than the informal areas of the city. We could also successfully scale the difference in this study where we calculated that the formal residential areas of the city have about 1.5 times more access to the education facilities than the informal areas which could not be a considerable amount of difference.

This research has thrown up many questions in need of further investigation too. Further work needs to be done to establish whether do the access to other types of facilities e.g. Medical and health facilities in the Kabul city is the same as the education services or in that case the differences are more obvious.

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