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

PART 3 (MEDICAL FACILITIES AND RESIDENTIAL AREAS)

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***Abstract*— In this study, firstly, we located the medical facilities in Kabul city. Secondly, defined the access and accessibility for the specified medical facilities based on the city planning standards of the Islamic Republic of Afghanistan. And finally, in order to find how fair, do the existing medical facilities are distributing in the city we analyzed them by calculating the accessibility rate to the medical facilities in Kabul city, in formal residential and informal residential areas of the city, and lastly in non-residential areas of the city.**

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

In short, the result of study clearly showed the unfair distribution pattern of the existing medical facilities in built-up areas of the Kabul city wherein accessibility rate to the medical facilities for the formal residential areas of the city much exceeded from the accessibility rate to the medical facilities in the informal residential areas of the city.

***Index Terms*— Formal Residential Areas, Informal Residential Areas, Kabul, Medical Facilities**

I. INTRODUCTION

Kabul is the capital and the largest city in Afghanistan. [1]-[2]-[3] It is located at the eastern part of the country. Sporadically reports estimated the population of the city to be around 4.7 million people respectively. [1] Most of them are the newcomers returned after the years of war and conflict. This mass change in the demography of the city [4] subsequently lead to the huge creation of the informal areas by mostly neglecting the original land-use (please see Ansari and Ono 2019). This fact—creation of informal areas in very short period of time—resulted in the enormous widening of the existing city without any official plan (Master Plan) to regulate or control the developments. [2] In two decades most of the stakeholders—that as per official reports are forming about 69 percent of the city at the moment—are living in the informal areas of the city with the very limited number of accessible facilities. One type of these very important facilities that will subsequently directly relate to the health and general wellbeing of the existing society and communities in Kabul city could be the medical facilities. Accordingly, in many places of the world, accessing to the medical services and facilities is strictly defined as one of the very first, necessary and the most important responsibilities of the governments. But unfortunately, to date very little attention has taken on the matter to bring this important issue under the investigation to find how well do the Kabul city is being provided with the medical facilities. Hence in this study as a pioneering effort we are going to investigate and compare the level of accessibility to the medical facilities in the formal and informal areas of the Kabul city. We are going to do that to find do there is a considerable difference in accessibility rate to the medical facilities in these areas or no. If there is a gap between them in being provided with the medical facilities thus in this study, we are going to find a way to could scale it quantitatively.

II. AIM AND PURPOSE

The aim and purpose of this study is to find how the medical or health facilities are distributing in the Kabul city. Analyze the existing pattern of distribution to find do really the access to the medical facilities in the formal areas of the city is better than the informal areas. If so, find a way to scale the gap quantitatively.

III. RESEARCH METHODOLOGY

In this study we followed exactly the same methodology as our last study 'Accessibility Analysis of the Urban Facilities in Kabul City Based on City Planning Standard: Part 1 (Education Facilities and Residential Areas)'. Thus, similarly we adopted a 3-stage methodology for this study as well. These 3-stages are: 1-Data collection, 2-Analysis, and 3- Presentation of the Result.

A. Stage 1: Data Collection

In this stage, as same as our previous study [5] we collected the necessary data and information from the different sources. In general, the collected data again can be categorized into two categories of the land-use data and the facility data.

1) The Land-use Data

The land-use data as same as the name indicates were subsequently those that provide information regarding the existing land-uses in Kabul city (e.g. residential and non-residential areas of the city, type of residential areas and so on). For this study, we used exactly the same geodatabase that was previously received from the Ministry of Urban Development and Land of Afghanistan (MUDL) for our last study. [5]

a) MUDL Land-Use Layer

Complete information regarding this layer has already been explained in our last study but if to shortly explain it we can say: The layer has been prepared by the MUDL [6] and subsequently it is one of the most important layers of our current study because in this particular layer 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 areas of the city in regard of accessing to the medical facilities.

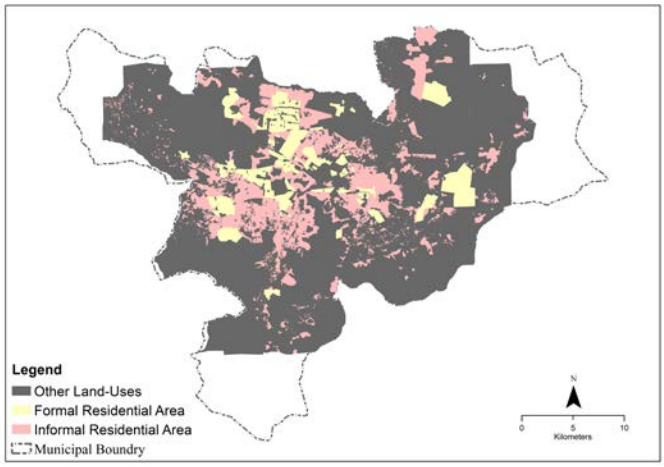

Fig. 1. MUDL Land-Use Layer

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 medical facilities of Kabul city e.g. geospatial data regarding existing medical facilities or the city planning standard to define the radius of accessibility. The collected data and information in this regard can be again as same as our last study divided into two categories of the geospatial data or the city planning data. [5]

a) Geospatial Data

geospatial information of the existing medical facilities in Kabul city were extracted from the following data and sources:

- The digital file that we kindly received from the respected Ministry of Public Health of Afghanistan to specify the location of the hospitals in Kabul city;
- Kabul existing land-uses layers received from MUDL;
- Online mapping services (google map, google earth, open street map and etc.)

In the process of data collection, we could successfully specify the geographical location of 128 medical facilities in Kabul city. (Fig.2)

b) City Planning Data

In order to define the access and accessibility for our study we subsequently used the same document as the city planning standard as we previously used in our last study. [5] This document that hereinafter will be referred by the term 'City Planning Standard' has been collected from the respected MUDL. The document is prepared in Dari language and based on our English translation of the cover page we named it as "The draft of Ministry of Urban Development and Housing's guideline for the preparation of the detailed urban plans". [7]

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

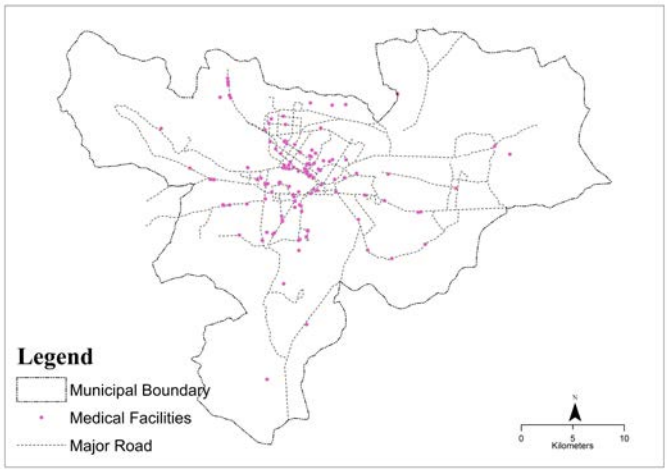

Fig. 2. Study Area and Specified Medical Facilities

B. Stage 2: Analysis

Analysis in this study is again the process of the manipulation of the geospatial collected data and information and city planning standard through ArcGIS software. Thus, accordingly first the access and accessibility is defined for the study. Then the radius of accessibility for each particular existing medical facility involved in the study will be defined accordingly. The result will be the medical facility layer.

Finally took the intersections between the land-use layers and the facility layers by the help of ArcGIS software will subsequently lead us to the answers of the initial questions that were asked in the section of the aim and purpose of the study. It will made us able to calculate the accessibility rate to medical facilities in the residential areas of the city, non-residential areas of the city, formal residential areas, and the informal residential areas of the city respectively.

1) Define the Access and Accessibility

Access or accessibility in this study as same as our last 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 medical facility.

2) Medical Facility Layer

Medical facility layer is the result of combination of the spatial characteristics of the specified medical facilities and city planning standard. For this purpose, in the first step the existing medical facilities were divided into two categories of district-level and neighborhood-level based on their type. Thus, accordingly the hospitals are assigned as the district-level services and the radius for them is defined as 1,000 meters based on the city planning standard. Other medical facilities e.g. clinics are assigned as the neighborhood-level category and the radius of accessibility for them was defined as 500 meters based on the city planning standard respectively.

Next, the radius of accessibility is defined for each particular specified medical facility involved in the study accordingly. (Fig.3)

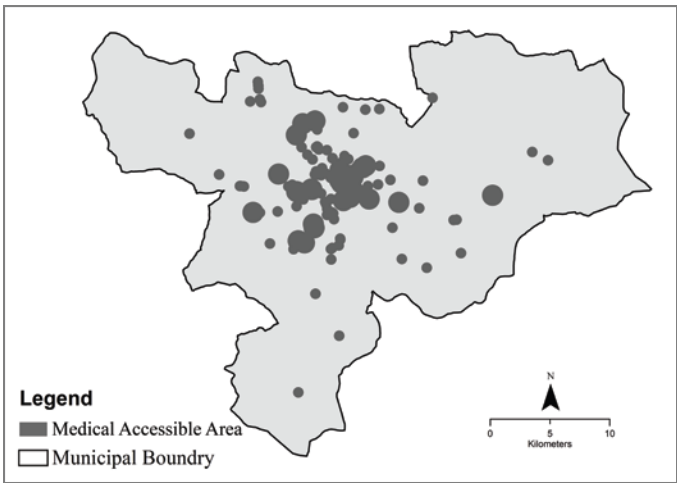

Fig. 3. Medical Facility Layer

C. Stage 3: Presentation of The Result

The results in our current study as same as our last study is the direct outcome of the analysis and they will be later presented either in case of the maps, or tables. For the graphical presentation the ArcGIS software and Microsoft Excel software were subsequently be used.

IV. EXISTING SITUATION

A. Existing Residential Situation

Based on the MUDL Land-Use Layer the residential areas cover about 20,248 hectares of land in Kabul city. As per what has been presented in the layer the informal residential areas of the city are currently holding a big share of that where they account for 69 percent of the total residential areas. (Table-1)

TABLE I. 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 Residential Areas	**20,248**	**100%**

B. Existing Situation Regarding the Medical Facilities

A look to the density map which is prepared by the help of ArcGIS software indicates that the medical facilities are also the category which are currently mostly concentrating in the central areas of the city. This was exactly the same in case of the education facilities in our last study as well. Anyway, in this map 1-kilometer radius is defined for each particular specified medical facility regardless of the type, importance level or any other specific characteristics. (Fig.4)

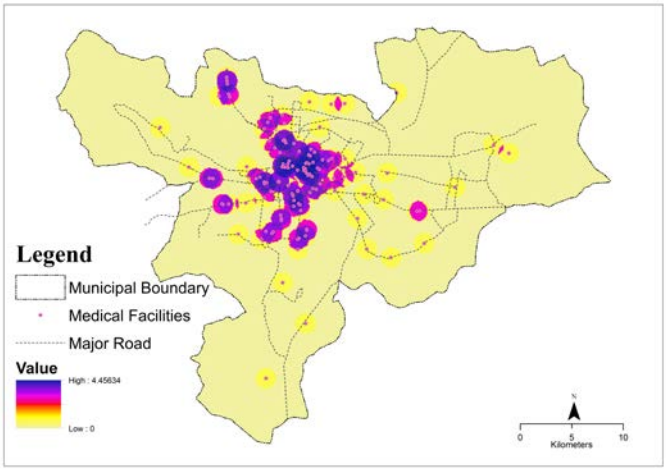

Fig. 4. Density Map of Medical Facilities

V. MEDICAL ACCESSIBILITY RATE

A. Medical Accessibility Rate in Kabul City

After analyzing the medical facility layer, we found out that the medical accessibility rate in Kabul city is considerably less than the education accessibility. In our last study we could find that the access to education facilities in Kabul city is about 19%. But in case of the medical facilities this number is calculated as less as only 9%. Based on our calculations the total areas that the medical services are currently accessible—based on city planning standards—within the Kabul city is around 9,219 hectares.

But as same as what has been indicated in the previous study this is quite clear and for sure logical that not all the areas within the city are currently holding for the residential purposes thus to exactly find how well do the residential areas are currently being provided with the medical facilities, we took an intersection between the facility layer and the existing land-uses layer. As a result of this action we were able to

exactly and precisely calculate the accessibility rate to the medical facilities in formal residential areas, informal residential areas, or residential and non-residential areas of Kabul city respectively.

B. Medical Accessibility Rate in Residential Areas

Intersection between the MUDL land-use layer and the medical facility layer by ArcGIS software subsequently revealed that from the total residential areas (20,248 hectares) about 5,354 hectares of them are currently located within the radius of accessibility of the medical services. This can be interpreted that the accessibility rate to medical facilities in residential areas of Kabul city is at around 26%. This number is quite less than the accessibility rate of the education facilities in the residential areas where in case of education this number was calculated to be as high as 58%. This mean that the access to medical facilities in the residential areas of the city is more than 2 times less than the access to the education facilities.

Next, by taking into consideration of the fact that the residential areas were consist to the both categories of formal and informal areas and due to the fact, that they are clearly distinguishable in the MUDL land-use layer thus, we were able to not only calculate the accessibility rate in residential areas but in the formal residential and informal residential areas of the city as well.

1) Medical Accessibility Rate in Formal Residential Areas

The previous intersection between the MUDL land-use layer and the facility layer also revealed that from the total formal residential areas (6,308 hectares) about 2,711 hectares of them are currently have access to the medical facilities.

Thus, based on our calculation we can state that the accessibility rate to the medical facilities in the formal residential areas of the city is calculated to be about 43% which could not be a satisfactory range.

Now we can claim that the accessibility rate to the medical services in the formal residential areas of the city is about 31% less than the accessibility rate to the education services in the same area. In the last study we could successfully find out that the accessibility rate to the education facilities in the formal residential areas of the city is as high as 74%.

As it is illustrated in Figure-5 most of the accessible formal residential areas of the city are those who are located in the central areas.

Meanwhile, about 3,597 hectares of the formal residential areas are located outside the accessible range of the medical facilities in Kabul city. This is quite a big number where based on our finding more than half of the formal residential areas are currently deprived of access to the medical facilities within the range that subsequently defined by the city planning standard. Figure-5 clearly shows these areas by light purple color. (Fig.5)

2) Medical Accessibility Rate in Informal Residential Areas

Intersection between the MUDL land-use layer and the medical facility layer also revealed that from the total informal residential areas (13,940 hectares) a very big proportion of them which is calculated to be at around 11,297 hectares are located away from the accessible range of the medical facilities respectively. This means that unfortunately currently about 81% of the informal residential areas do not have access to the medical facilities in Kabul city. Thus, the accessibility rate to the medical facilities in the informal areas of the city is calculated to be as less as only 19%. Figure-6 clearly indicate this fact. (Fig.6)

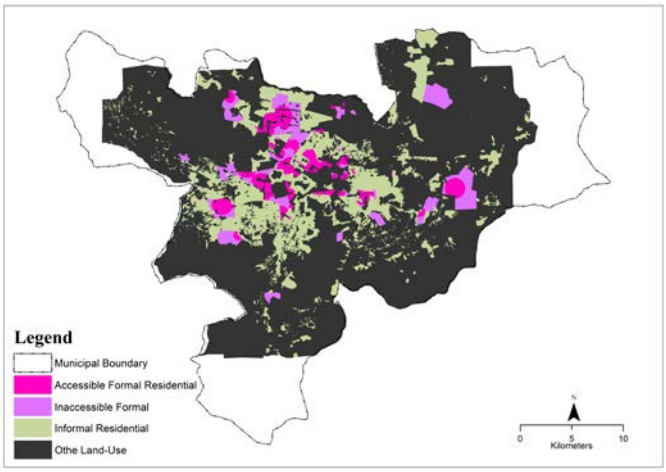

Fig. 5. Formal Residential Areas and Access to Medical Facilities

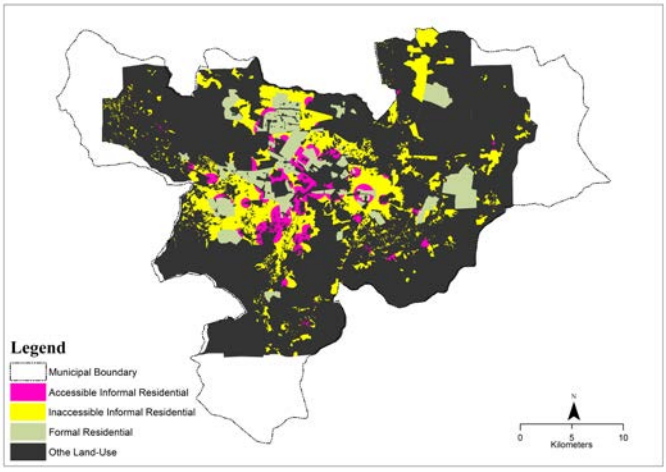

Fig. 6. Informal Residential Areas and Access to Medical Facilities

If to compare the result of this study with the education facilities we can say that in case of the medical services the accessibility rate in the informal areas of the city is about 2.6 times less than the accessibility rate to the education facilities within the same area. Our current study also revealed that the ongoing belief in case of the inequalities of accessing the facilities between the formal and informal residential areas of the city is too obvious in case of the medical facilities. Based on our calculation we can say that those who are living in the formal areas of the city currently have access to 2.3 times more medical facilities than those who are living in the informal areas of the city. This show a big bias in this case while in our last study this number was calculated to be as less as 1.5 times for the education facilities.

C. Medical Accessibility Rate in Non-Residential Areas

Based on the result of the study we can also say that from all the non-residential areas of the city (61,042 hectares) about 3,865 hectares of them currently have access to the medical facilities. This means that about 57,177 hectares of them—in other words, 94% of them—are located out of the accessibility range of the medical facilities in Kabul city. This result subsequently means that the accessibility rate to the medical facilities in the non-residential areas of the city is at unbelievable low rate of about 6% only. This fact is clearly shown in Figure-8. (Fig.7)

This result means that the accessibility rate to the medical facilities in the non-residential areas of the city is about 2.3 times less than the accessibility rate to the education facilities within the same areas where in our last study we could successfully found that the accessibility rate to the education facilities in the non-residential areas in Kabul city is about 14%. [5]

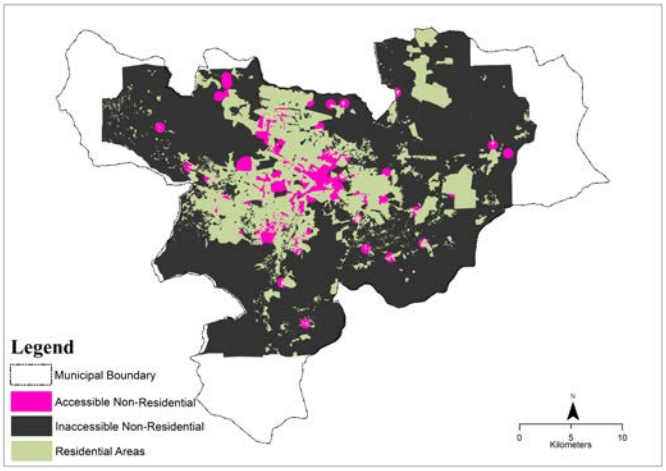

Fig. 7. Non-Residential Areas and Access to Medical Facilities

VI. Conclusion

The result of this study clearly showed that the amount of the current medical facilities is not enough for a city as the size of the Kabul city. Our calculation clearly revealed that currently most of the residential areas are locating outside the accessibility range of the existing medical facilities respectively.

We could also find out that the degree of bias in the unfair distribution of the medical facilities is much more obvious where the formal residential areas of the city have currently access to much more medical facilities than the informal residential areas. Our calculations revealed that the access to the medical services in the formal residential areas of the city is about 2.3 times higher than the informal residential areas which is quite a big difference.

The result of the current study also revealed that the access to the medical facilities in the Kabul city is much less than the access to education facilities. We can surely say now that in all the cases the access to education facilities is by far more than the access to medical facilities in the city of Kabul.

Our current effort again thrown up many other questions in need of further investigation. Thus, here we have to re-state this fact again that the further studies need to be done to evaluate the accessibility rate to other types of the facilities in the Kabul city to find out how well do they are currently distributing in the city.

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