A Social Infrastructure Planning Based on Accessibility Analysis – A Review

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Abstract

India is a 2nd most populous country in the world with more than 1.35 billion residents. Due to the rise in demographic trend in the population, there will be more demand in infrastructure especially social infrastructure. Analysis of accessibility of social infrastructure provision is useful for long term planning. This paper clarifies the relationship between the work can be done and previous work conducted on planning for social infrastructure facilities. The overview of measures to evaluate the provision of these facilities and methods to improve the social infrastructure provision is also reviews. Also describes an extensive literature study based on planning of social infrastructure through accessibility and how GIS techniques can be used for it.
Keyword- Social Infrastructure, Accessibility, Spatial Planning, Geographic Information System

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I. INTRODUCTION

Social infrastructure can be defined as the construction and maintenance of facilities that support all social services which are necessary for human development. It includes schools, hospitals, prisons, community housing, etc. But not include provision of social services like the provision of teachers at a school, etc. The two techniques used to evaluation of social infrastructure are Accessibility and Location-Allocation analysis.

There are many definitions of accessibility but it is depends on the nature and goal of the study. In present study accessibility is used to measure nearest existing facility of social infrastructure. It is an amount of effort for a person to reach a final destination. Location-Allocation analysis used to confirm the positions for one or more facilities to be constructed, which can help to supplying facilities in the most effective and economic method. There are many software to analyze location-allocation such as ArcGIS, ESRI, TransCAD, and Flowmap.

The planning of provision of social infrastructure is based on neighbourhood concept. As shown in figure 1 each neighbourhood arranged by overlap with each other to support joint use of facilities such as hospitals, schools, theatres, etc.

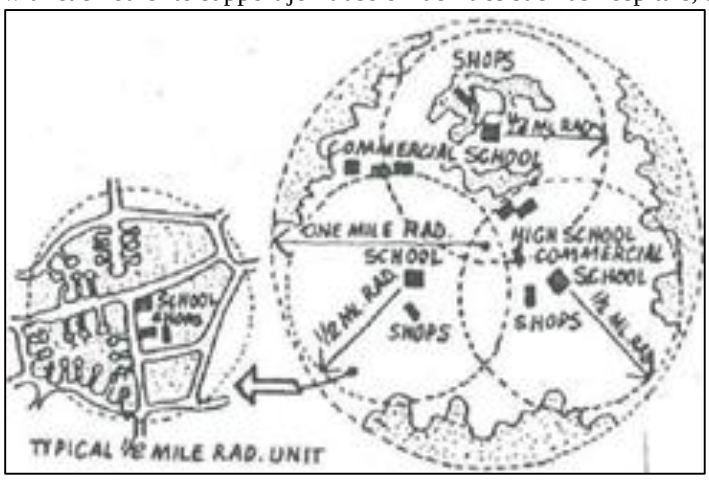

Fig. 1: Conception of the neighbourhood unit
Source: Neighbourhood Concept, Mubashshar Sultan

The land allotted for the purpose of schools; should be 1.2 hectares to 3 hectares for the Neighbourhood; and 2.4 hectares or 6 hectares for any sector. This area also includes the size of the playground required by the school. The built up areas for the schools in a Neighbourhood can be 1 / 6 of the total plot area that is allotted for the same.

Medical facilities should be on the basis of 2 beds per 1000 population. The hospital should not be located at the end of the town, but it should be near the town centre to provide easy access. 12 to 16 hectares of land; should be adequate to take care of the requirements of the medical centre; along with the 65,000 to 1, 00,000 population.

II. COMPONENTS OF ACCESSIBILITY

There are number of components used to measure accessibility.

1) Transport Components: It is described in terms of travel time, travel cost and effort made.
2) Land use component: It is disclosing the spatial distribution of activities at origins and final destinations.
3) Temporal component: It is reflecting the activities in time as day, week, season, year, etc.
4) Individual component: It reflects the capacity, opportunities and needs of individual users. The needs deal with age, education and health level, status of user, income, etc; Ability in terms of age, physical condition, etc; Opportunity that means budget, income, etc.

III. ACCESSIBILITY MEASUREMENT

As discussed the concept of accessibility it is essential to know the measurement techniques and method for quantifying the concept of accessibility which help in the process of planning.

There are four perspectives to measure accessibility.

1) Infrastructure-based accessibility measures: It is analyzing performance of transport infrastructure. So that this type is used in transport planning.
2) Location-based accessibility measures: It is analyzing accessibility at locations. Such as the how many number of schools within 30 minutes travel time from origin location. This type is use in urban planning and geographical studies.
3) Person-based measures: It is analyze accessibility at particular level.
4) Utility-based measures: It is analyze individual benefits arrived from approach to the spatial distributed activities and hence mostly used for economic studies.

IV. FACTORS AFFECTING ACCESSIBILITY

There are some factors that may affect accessibility which include transportation demand and supply, extent of mobility, availability of choices, affordability, and land use pattern and mobility substitutes.

Transportation demand and supply may depend on several factors such as demographic attributes, purpose of travel, time of the day, distance of travel. Litman (2012) argues that people‘s accessibility may change with latent demand for transportation and the activity on road.

Mobility is measure of physical movement of people and expressed in terms of person-kilometres. Availability of choices can useful to improve people‘s accessibility because there are various modes which serving the same destination.

Affordability associated with the usage or non-usage of transportation which refers to the financial implications. Litman (2012) goes on to demonstrate how lower income people forced to live in an Automobile-dependant locality as they cannot afford the personal cars.

Land use pattern can play a vital role in determining accessibility because it depends on where people live and where they seek employment. Due to the unregulated land use pattern, people would be forced to travel more to reach the destination so that people will more depend upon the private modes of transportation leading greater congestion and diminishing accessibility.

Mobility substitutes can significantly overturn accessibility by doing away with the need to travel altogether. This can be achieved by provide door-to-door delivery services. The internet and mobile banking services are a classic example of this.

V. OBJECTIVE

To study different techniques involved in provision of social infrastructure.

VI. LITERATURE REVIEW

(Bhasker. V. Bhatt; Kevin Kapadia; Dr S. K. Dave, 2018) decoded the development extent and potential in the study region of Dahej PCPIR that is upcoming as an important Special Investment Region in the Gujarat State of India. They aimed to evaluate the necessity for social infrastructure based on projected population scenario looking it as a potential for future investment in contributing to increase the quality of life for the workers as well as families thereof who choose to reside in the region. They proposed a population projection considering diverse aspects concerning industrial needs. Based on the analysis, the needs in housing sector under various categories and classes are projected. Besides, the needs for social infrastructure, addressing the education, health, socio-cultural, open spaces, recreational spaces, sports facilities, distribution services, safety and security

services, and safety management are identified and envisaged for need-based development that generates an opportunity at different levels.

(R K Patel; N B Rokad; B V Bhatt, 2018) The paper discussed on urban health and care facilities. The study seeks attention from the authority to avail all such infrastructure (social) and services (health and care) to be available with maximum possible accessibility by the citizens. The study aimed to identify the demand-supply and gaps underlying in the sector using population projections by AIM and IIM tools. It also includes recommendations to carry out detailed planning and allocation prioritisation of facilities at different zones (through TPS mechanism of land plot reservation).

(Charlington Leo, 2017) discussed about accessibility of health infrastructure especially hospitals in the Vanuatu country. Firstly, he has found out the existing available hospitals. Then he has analyzed the current trends of flights and the location of existing location. Then he has found suitable area for new hospital in the future with reference to the Vanuatu Health Policy.

(Prof. Darshini Mahadevia; Dr. Talat Munshi; Mr. Rutul Joshi, 2014) critically analyzed the prevalent planning paradigm in detail and identified gaps in the DP/master plan centric approach to land use planning, concentrating especially on the lack of intent to tackle local level planning issues. This research project pitches forward a case for accessibility and people's aspirations based planning paradigm - one that marries technical of the extent of such accessibility is discussed. The methodology was arrived at by looking at critically examples of planning at the local level that has been experimented and persisted with in various contexts like United Kingdom, United States of America, The Netherlands and New Zealand. The proposed methodology also draws from the experiences of cities like Pune, Bangalore and Delhi.

(Ilhamdaniah; Talat MunshiI; Sherif Amer, 2014) describes how GIS technology can be used for planning of social infrastructure. The problem addressed in this paper arises as each TPS is planned for on an individual, one by one, basis even if different TPS areas are spatially adjoining. The potential outcome is that the spatial distribution of social infrastructure may not be efficient or equitable. The study proves how simple GIS techniques like accessibility and allocation analysis combined with allocation models can be used to improve allocate and plan social infrastructure facilities and it also demonstrates that such measures can be applied to improve the present plans of land use and land allocation.

(Faisal Talib; Zillur Rahman;, 2013) studied the demographic characteristics of healthcare and hospitality industries of India through a survey. For that, authors have made a questionnaire to collect the relevant data from healthcare, hotels and tourism companies. From that they have come to know the demographic profile of these facilities and then found level of service of those facilities.

(Wai, Yusof, Ismail, & Ng, 2013) developed a framework for success factors of SIP for Malaysia and analysed the results of a survey. Also represented the idea that identifies the success factors in the provision of SIPs to address the dynamic nature of the industry. Criteria for success and Relationship between success factor and success criteria have also been given.

(Dilip V. Mavalankar; K V Ramani; Amit Patel; Parvathy Sankar;, 2010) assessed the coverage and gaps in infrastructure for Maternal and Neonatal Health. It also identified critical issues related with infrastructure management and analysis their causes and impact on services delivery to the poor. The paper also reviewed impacts of reforms on infrastructure and according to that provide some recommendations for improvement of infrastructure to the poor. Also give the suggestion for the better health infrastructure.

(Adnan Diwan, 2009) calculated the Coverage of health care facility and shows that the reach of facility with respect to its maximum capacity and travel distance. For the study area all health care facility (Public as well as private provider) was selected. According to that gives recommendations for the improvement of accessibility to social infrastructure for the city of Surat. Once the existing situation is evaluated, facility citing is done for additional facilities which are required to serve the un-served population. This is done with help of location allocation analysis in Flowmap software.

(Debra Revere; Anne M. Turner; Ann Madhavan; Neil Rambo, 2007) focused on the information which is needs of public health professionals. Also the literature on public health are reviewed to answer the following questions as; what are the information necessary?, in what ways are those being met? And what are the barriers to meeting those? The aim of this system was to support the collection, management, and retrieval of public health data, learning objects, and tools.

(Ilhamdaniah, 2005) finds problems related to social infrastructure provision. Also finds that problems are more in planning stage at which these facilities should be planned. And the issues of how to plan these facilities is related to the manner in which facilities are planned within TPS. And gave recommendations according to that.

VII. URDPFI GUIDELINE

For provision of social infrastructure URDPFI guideline has been used which is shown in table 1. From that health norms for the provision of the new facility has been considered. The size of a hospital depends on requirement of beds in hospital and size of the population it serves [12].

Sr. No.	*Category*	*Population served per unit*	*Area requirement*
	General Hospital (More than 300 beds)	*2.5 lakh*	*6.00 Ha*
	Intermediate Hospital (Category A) (200 beds)	*1 lakh*	*3.70 Ha*
	Intermediate Hospital (Category B) (80 beds)	*1 lakh*	*1.00 Ha*
	Primary Health Centre - Nursing home, child welfare and maternity centre (25 to 30 beds)	*45,000 to 1 lakh*	*0.20 to 0.30 Ha*

	Community Health Centre – Polyclinic (Less than 10 beds)	*1 lakh*	*0.20 to 0.30 Ha*
	Sub Centre – Dispensary	*15000*	*0.08 to 0.12 Ha*

Table 1: Guideline on Health Care Facilities
Source: URDPFI guideline, Vol. – 1 page no.359, 360

VIII. CONCLUSION

The study has been focused on different techniques to evaluate the social infrastructure and finds problems related to their provision. Also the application part, measuring the accessibility and location allocation has been discussed. Some of the study develops a framework for SIP in Malaysia, discussed about accessibility of health infrastructure in the Vanuatu country. Some of the study provided demographic characteristics of Indian health care, calculated the coverage of health care facility, travel distance to reach the facility, how planning of social infrastructure can be done with the help of GIS techniques. But the demand increases with increase population hence, it is advisable to found the number of facilities needed as per the population and work on the accessibility analysis for the health facilities.

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