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Original Research Paper

Universal Mobility in old core cities of India: *People's Perception*

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Abstract: In this research, users' perception towards Universal Mobility in old core cities of India has been critically analyzed. Despite Universal Design guidelines from the United Nations and Union Government of India, old cities in India are seldom having Universal Mobility, in effect endangering the lifestyle of senior citizens and differently-abled people. The core of Kolkata Municipal Corporation in Kolkata, India has been considered as a case example for this research. This research has considered three types of data sets for analysis. First, the authors interviewed 310 respondents from the Indian design fraternity, with the objective of understanding their opinion on the concept of Universal Design. In the next investigative study of 125 respondents from different wards of Kolkata Municipal Corporation, the purpose was to comprehend people's perception about walkability and mobility in an old Indian city. In the last visual survey of a stretch in Central Kolkata, the focus was identifying the hindrance in Universal Mobility in an old city core of Indian origin. Significant dissatisfaction was found in walkability amongst all user groups; which is linked to poor infrastructural conditions. Furthermore, accessing public transportation is difficult due to improper waiting facilities. However, the design fraternity in India suggests the need of separate accessibility guidelines for old and new cities in India. The design fraternity also recommends a customized rating system for accessing Universal Design. The result of this study indicates a need of recognizing the difficulty in imparting Universal Mobility in old core cities in India. This information can be used for preparing an Access Audit Checklist through Architectural Planning, which is the first step in proposing a framework for Universal Mobility in old core cities in India.

Keywords: Universal Design, Mobility, Old Core Cities, Walkability, Central Kolkata, Architectural Planning

1. Introduction

According to the 2011 Census of India, 2.21% of Indian population or 26.8 million people are disabled (Social Statistics Division, Ministry of Statistics and Programme Implementation, 2016). The medically approved disability categories as per Census 2011 were: (a) vision, (b) auditory, (c) verbal, (d) movement, (e) mental retardation, (f) mental illness, (g) multiple disabilities, and (h) any disabilities other than the ones mentioned but clinically verified. Furthermore, only the people under aforementioned medically approved categories were considered for the facilities/benefits provided to differently-abled, as per Indian guidelines like 'Article 41 of Constitution of India'[1] or, 'The Person with Disabilities (PwD) Act, 1995[2] (Central Statistics Office, Ministry of Statistics and Programme Implementation, 2016). In contrast, the 'Right to Persons with Disabilities Act, 2016' recognizes twenty-one types of health conditions (Ministry of Law and Justice, 2016). Thus, the number of 'medically disabled' in India is substantially higher than the data published in Census 2011. One of the hindrances in the Indian disability scenario is

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the national reluctance towards shifting of focus from the medical model of disability towards a logical model. As a result, the 103.8 million elderly people (as per 2011 census) were also not included in the category of receiving facility/ benefit (Solanki & Khare, 2018).

Article 9 of the 'United Nations Convention on the Rights of Persons with Disabilities' (hereafter, UN-CRPD[3]) suggests equal oppurtunities for differently-abled people in these three aspects: (a) Physical environment, (b) Transportation, and (c) Information and Communication. Article 9 of UN-CRPD also directs the member nations to implement 'universally designed' public facilities (United Nations, 2008). Along these lines, Goal Number 11 of 'United Nations Sustainable Development Goals' (hereafter, UN-SDG[4]) specifies 'Sustainable Cities and Communities' which aims towards making cities and human settlements inclusive, safe, resilient, and sustainable. Target 11.2 (within Goal Number 11 of UN-SDG) elaborates that by 2030, all the member nations of the United Nations should provide access to safe, affordable, accessible and sustainable transport systems for all. Additionally, the member nations should improve road safety, especially by expanding public transport. Furthermore, Goal 11 specifies that the aforesaid developments be done with special/ distinctive attention to the needs of: (a) those in vulnerable situations, (b) women, (c) children, (d) persons with disabilities, and (e) older persons (United Nations Department of Economic and Social Affairs, 2015). Thus, in these times of globally changing demography[5], both UN-CRPD and UN-SDG suggests the concept of Universal Mobility for enabling movement within a city without discrimination on the basis of physical or mental limitations. India, being a member nation is required to act on these similar lines of action towards a 'Universally Designed' built environment.

In contrast, most of the Indian documents related to Universal Design/ accessible design are mere guidelines and not mandatory rules; thus their implementation for accomplishing 'barrier-free'[6] or 'inclusive' built environment at societal and/or urban-level[7] has not happened (Mahapatra & Mandal, Accessibility in core areas of cities; Case Study: Road Stretches in Shimla, Himachal Pradesh, India, 2018). Authors further argue that in spite of being a member nation of UN and one of the signatories[8] in UN-CRPD, India has a gap in the policy framework of Universal Design's implementation. However, authors also suggest rectifying the gap by strategic interpretation of the latest disability data and taking into account the need of Indian citizen. In India, the accessibility conditions are comparatively low in 'old cities'[9] in comparison to accessibility provisions in newly planned cities. Owing to the ever-increasing population[10] of India and high density[11] in its historically-developed organically-planned core cities, 'accessibility'[12] becomes more complex than most of the countries abroad. Thus, dealing with accessibility in old city parts of India is an interesting as well as an important domain of urban infrastructure (Mahapatra & Mandal, Re-inventing Urban Spaces by accessing accessibility in old city core: A case of Kolkata, 2019). As an example, post-independence[13] planned cities like Chandigarh[14] and Bhubaneswar[15] have relatively better facilities/ options for differently-abled and senior citizen[16], than cities like old parts of imperial Kolkata[17] or colonial Delhi[18].

As a general practice in urban India, the practices of Universal Design guidelines or Barrier Free are comparatively more at Building level, and not at site/ precinct level (Mahapatra, Devanath, & Chakraborty, Inclusivity in Indian Spatial Standards: A changing paradigm, 2021). Universal Mobility connects the missing links between 'Universally Designed' buildings and 'Universally Designed' premises/ precincts; and creates accessible urban spaces. In India, a project like 'Mass Rapid Transit System'[19] in Delhi has initiated the process of inclusive transportation (Raheja & Jaiswal, 2014). However, on a large scale, the UN-CRPD's focus on Universal Mobility is not yet addressed in Indian guidelines. Likewise, Indian cities are still lagging behind in creating accessible urban spaces because of practicing 'inclusive transportation', instead of 'Universal Mobility'. 'Inclusive Transportation' focusses on making the mode of transport accessible to all; for example, accessible railway station or accessible bus stop. The aspects covered in 'Accessible Transportation' are: (a) Access to the station, (b) Fare payment, (c) Travelling

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information and communication, and (d) Interior conditions of the mode of transport (Babinard, 2010). 'Universal Mobility', in contrast, is a policy level intervention at the city scale ensuring a minimum standard of mobility for all members of society (Caywood & Roy, 2018). Thus, 'Universal Mobility' is technically sound than 'Inclusive Transportation'.

Urban reforms in India particularly focusing on improving the quality of life in an inclusive way has substantially increased in recent years. One of such initiatives has been 'Accessible India Campaign'[20] (launched in December 2015) in consonance with Article 9 of UN-CRPD. 'Accessible India Campaign' has a number of components which promotes accessibility in: a) Built Environment, b) Transportation System, and Information and Communication Eco System (Department of Empowerment of Persons with Disabilities, Ministry of Social Justice & Empowerment, 2015).

In similar lines, through interviews and surveys during this research, authors inferred that for this research, 'Transportation System Accessibility' (involving vehicular traffic and walkability) be dealt with greater focus than the other two components. At an objective level, the focus of UN-CRPD towards Universal Mobility relates to the 'Transportation System Accessibility' component of the Accessible India Campaign. The global focus and national demand made the authors focus on the topic of Universal Mobility rather than any other aspect of Universal Design, for this research.

1.1 Research Components

Aim of this paper is to determine the status of accessibility in the core areas of an old Indian city; by identifying factors of an ideal accessibility audit checklist[21].

The objectives to strengthen the aim are: (a) To ascertain the need for a new dimension in the Indian accessibility scenario, (b) To assess people's perspective towards Universal Mobility in core urban areas in India, and (c) To identify the issues in mobility in core urban areas in India.

The underlying research question for this paper is to find out whether core areas of urban India can be made inclusive in terms of accessibility. The hypothesis considered for this research is that the core cities in the Indian context need to be made accessible through provisions in planning and design. The paper shall only find out the factors that constitute the parameters in Audit Checklist.

1.2 Research Process

Figure 1 summarizes the Research Process undertaken for this research. The column on the left of Figure 1 shows the research stages and the column on the right explains the activity related to that research stage.

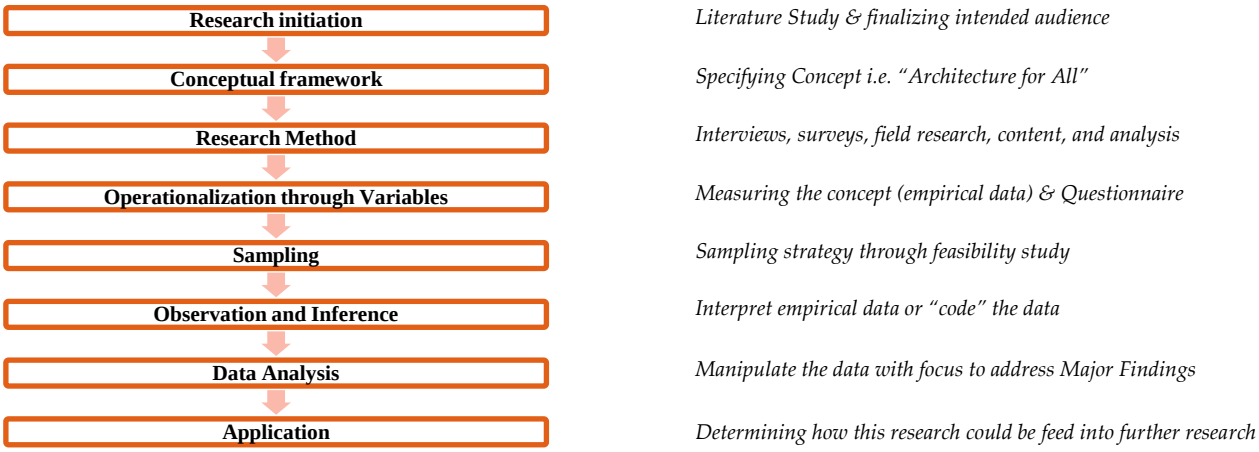

Figure 1. Research Process followed for this paper (Source: Author)

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2. Literature

Ronald Mace[22], who coined the term Universal Design, defines Universal Design as the design of products and environments which is maximally usable by all people without the need for any adaptation or specialized design (Mace, 1985). The 'International Classification of Functioning, Disability and Health' of 'World Health Organization'[23] (hereafter, W.H.O.) mentions that disability is a phase, and it is not specific to any age or gender (Kumar, Roy, & Kar, 2012). 'Inclusive design features'[24] in the built environment affect the independence of elderly/ differently-abled. Additionally, exclusive barrier-free mobility options at the city level (like: ramps and braille signage) improve the quality of life for the elderly/ differently-abled. Conversely, hedonic adaptation[25] and age-cohort effects[26] can undermine the need for such 'exclusive' inclusive features (Minucciani & Nilufer, 2020). Thus, the authors further state that instead of focusing on specific facilities for differently-abled and elderly people, encouraging 'Universal Mobility' uplifts the inclusiveness of urban space.

2.1 Universal Design Theory

Goldsmith (2000) establishes the need for a bottom-up route towards Universal Design and proposes a model of 'Universal Design Pyramid'[27]. Goldsmith's 'Universal Design Pyramid' indicates that Universal Design facilitates the able-bodied and differently-abled alike (Goldsmith, 2000). Universal Design implementation on a national or regional-scale depends on the pattern in which user-experience based inputs gets implemented into the planning legislation (Heylighen, Linden, & Steenwinkel, 2017). Likewise, Universal Design solutions are socially and financially rewarding since they make spaces easier for everyone to use (Herring, 2015). Based on the inclusive civil engineering guidelines[28] in India since 1987, designers in India often provide separate provisions for differently-abled people; without realizing that separate facilities promote societal inequality. Story (1998) clarifies that correctly implemented 'Universal Design' is often undetected since it integrates with the design process. Being accessible to all user groups from the start of the design usability implies seamless implementation of Universal Design strategies (Story M. F., 1988). Thus suggesting a facility specifically for elderly/ differently-abled is negating the very concept of Universal Design.

Furthermore, Steinfeld and Danford (1999) establish that in spite of the origin of Universal Design since the mid-1970s, Universal Design concepts still lack practical implementation due to lack of adequate contextual theory (Steinfeld & Danford, 1999). Similarly, Steinfeld (1975) holds that inclusion of empirical data gathered from 'human-centric research'[29] related to spatial behaviour of differently-abled people, is an ideal way to implement Universal Design solutions (Steinfeld E. , 1975). Thus, this paper includes human behaviour and user experience as the base of research.

In Architectural Planning[30], the three levels of design hierarchy are: (a) Site, (b) Services, and (c) Building. In Universal Design professional practice, the building level is better addressed by designers since the scale of the development is smaller in comparison to other factors. However, without inclusive site and services, the individual buildings will be inaccessible to all in spite of being universally designed (Maisel, Steinfeld, Basnak, Smith, & Tauke, 2018). Likewise, during the primary survey for this paper, even respondents prioritized Site and services for the Universal Design considerations.

2.2 Fundamental Understanding of Accessibility

There are ideological differences in the way different nations perceive Universal Design, since Universal Design came into effect from 1985[31] (originated in the United States) and Barrier Free Architecture existed since 1974[32] (originated from Machida City, Japan). Akiyama and Kim (2005) establish that unlike the United States where Universal Design signifies disabled-friendly approaches, in countries like Japan it is more holistic. Japan uses Universal Design principles as a mode to facilitate the entire population. Relatively new initiatives like 'Transportation Accessibility Improvement Law, 2000[33]' or old projects like 'Welfare model cities for the disabled, 1973[34]' reflects Japan's focus on using

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Universal Mobility as an infrastructural as well as a social tool in enabling the environment for all (Akiyama & Kim, 2011).

However, In India, the situation is different from countries like the United States or Japan. Likewise, Indian Universal Design Principles were published in 2011, which proposed five principles: (a) *Saman* (Equitable), (b) *Sahaj* (Usable), (c) *Sanskritik* (Cultural), (d) *Sasta* (Economic), and (e) *Sundar* (Aesthetic). The 'Indian Principles'[35] is different from the Seven Principles of Universal Design that was being followed in India till the inception of these principles (Khare, Mullick, & Raheja, 2011). Apart from political and administrative difficulties, a cultural stigma is also attached to the Universal Design thinking in India. Disability in India has been associated with past sins, and the disabled people are historically ignored in social/ religious participation (Gupta, Witte, & Meershoek, 2020). Thus, implementing Universal Design guidelines in India is substantially complex; and requires an audit to assess the condition of inclusivity before imparting Universal Design. The audit shall specify the degree of accessibility required in a site-specific manner.

2.3 Universal Mobility in Urban area

Walkability conditions and transportation facilities are the two primary components of urban mobility. Nevertheless, poor infrastructure like irregular footpath spaces and dissatisfactory pedestrian slope poses threat to elderly/ differently-abled bodied and abled bodied alike. Additionally, any physical barriers in urban mobility are against the notion of 'right to city[36] or city for all' (Mahmoudi & Fanaei, 2010). In the course of this research, authors observed a similar phenomenon in central Kolkata. The photographs of a stretch central (core) Kolkata shown in Figure 19-30 depict the dilapidated mobility conditions.

Along these lines, Frye (2014) argues that global ageing population complemented by falling birth rate, is posing an infrastructural challenge to the increasing urban population. Frye's paper identifies several factors that influence urban mobility: (a) Overcrowding of vehicles/terminals, (b) Uneven or broken road surfaces, (c) High kerbs/deep storm drains, (d) Inaccessible public transport vehicles, (e) Cost/affordability of public transport, (f) Attitude of drivers and other staff, and (g) Lack of accessible information. Frye validated these factors by correlating age and disability (Frye, 2014). The authors used the factors from Frye's paper along with some contextual factors while conducting visual observation of the old core of Kolkata *(elaborated in- Section 3.3: Visual observation of an old city core).* While transportation is widely researched, 'walkability' for a diverse user group is a relatively restrictive topic in academia.

Similarly, Mori (2001) proposes that for researches involving high human behaviour interface, the methodology should involve the feedback of the end-user from the beginning of the research (Mori, Funahashi, Takeshi, & Michihiro, 2001). Mori (2002) further explains that walkability involves an intricate relationship with space structure and mentions the needs to include children, elderly and disabled people in researches involving walkability (Mori, Oku, & Hasegawa, Characteristics of action in strolling behaviour- A basic study on act-finding in Urban Space, 2002). Factors affecting user's behaviour in the urban street spaces have a positive or negative effect depending on the genre of infrastructure and mobility condition of the user group (Do, Mori, & Nomura, 2018). Architectural planning research methods by comparing and/or relating the rational parameters (like, zoning and space allocation) with qualitative factors (like pedestrian behaviour), is an effective way to urban mobility-related issues in old core cities (Espina, Mori, & Nomura, 2018). The space structures in old cities of developing nations like India are complex due to their historic origin. These areas have high density, mixed land use, and lack of space allocated to infrastructure.

The learning elaborated in the last three subsections 2.1 (Universal Design Theory), 2.2 (Fundamental Understanding of Disability), and 2.3 (Universal Mobility in Urban Area) are linked to the objectives and shown in Figure 2. Before starting the data collec-

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tion and analysis, the authors for this paper created a knowledge base that helps to proceed further towards objectives; and subsequently, answer the research question.

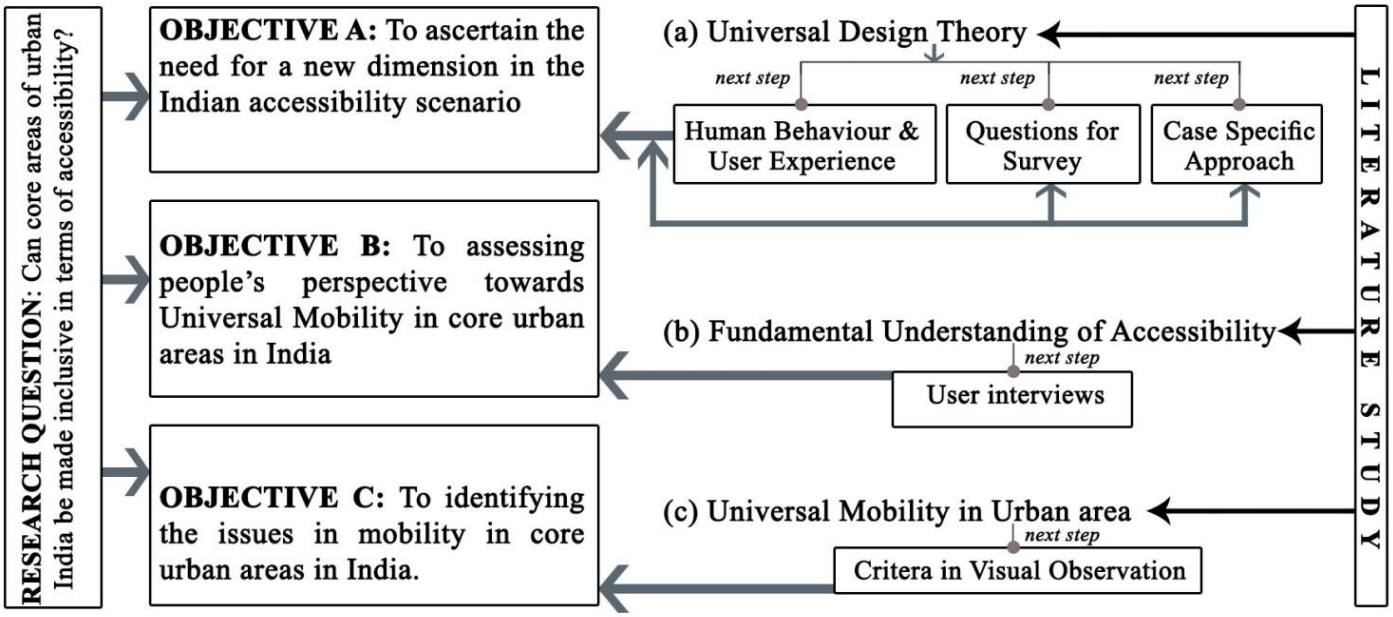

Figure 2. Linkage between Research question & Objectives with Learning from Literature Study [Author: Top left] (Source: Author)

3. Survey and Results

The details of the three surveys as mentioned in Section 2 are elaborated in this section of the paper. Authors have explained each survey in three basic parts: (a) Survey process, (b) Observation and Analysis, and (c) Findings and discussion.

3.1 Opinion of Design Fraternity in India

The design fraternity of a country, which includes architects, planners, designers, and civil engineers, are responsible for the task of nation-building in terms of infrastructure. Thus, Indian design fraternity's opinion was essential for substantiating the aim of this research. Authors conducted eleven 'virtual interactive platforms'[37] in various parts of India for discussing the intent of this research with the design fraternity of India. The platforms included workshops, seminars, studio, Technical Education Quality Improvement Program (TEQIP), and lectures. Table 1 shows the details of the eleven virtual interactive sessions.

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Table 1. List of interactive sessions in India between June-November 2020, for substantiating the aim of the research (Source: Author)

S. no.	Date	Type of session	Title of session	Location
1	25-28 Jun	Summer Studio	Universal Design	SAKHA, Nagpur
2	27-29 Jul	Workshop	Being Creatively Rational	School of Architecture and Interior Design, SRM Institute of Science and Technology, Kattankulathur
3	07-09 Aug	Technical Education Quality Improvement Programme	Universal Design: Architecture for All	Department of Architecture, Madhav Institute of Technology and Science, Gwalior
4	14 Aug	Webinar Series	Universal Design and Accessibility- A route towards Sustainability	Jawaharlal Nehru Architecture and Fine Arts University, Hyderabad
5	19-21 Aug	Workshop	An Architect's Approach towards Universal Design and Accessibility	School of Architecture, DY Patil University, Pune
6	28 Aug	Semester Coursework Expert Lecture	Universal Design Approach	Akhil Bharatiya Maratha Sikshan Parishad's Anantarao Pawar College of Architecture, Pune
7	05 Oct	Webinar	Universal Design	School of Architecture, Central University, Ajmer
8	06 Oct	Guest Lecture	Being Creatively Rational	Rajalakshmi School of Architecture, Mevalur-kuppam
9	06-08 Oct	Semester Coursework Expert Lecture	Universal Design and Accessibility	Marathwada Mitramandal's Institute of Environment & Design's College of Architecture, Pune
10	28-29 Oct	Workshop	Being Creatively Rational	School of Architecture, Delhi Technical Campus, Noida
11	08 Nov	Institute of Town Planning Annual Lecture	Assessing accessibility for equitable planning; with focus on disabled and elderly	Institute of Town Planner India, Kolkata

Architects, Planners, Designers, Government Officials, Architecture Students, and Planning Students, attended these virtual interactive platforms. Although there were eleven venues, the participants belonged from over sixty cities across India. The major content of the workshop included: (a) Introduction to Universal Design and its salient features, (b) International and National Guidelines on Universal Design, (c) Anthropometrics and Ergonomics in Universal Design, (d) Application of Universal Design in different building types and streetscape, and (e) Accessibility Audit. The authors were the primary mentors for the sessions, occasionally complemented by other experts from the field of accessibility and spatial design. The major learning from this workshop included: (a) Consciousness about the dissimilarity between Universal Design, Barrier-Free Standards, and Inclusive Design, (b) Facilitating participants towards using the 'Universal Design' principles in Architectural Design and Urban Planning, and (c) Realizing that in Architecture and Planning, Universal Design is not a choice but a prerequisite. Authors included interactive exercises and idea exchange sessions in the lecture sessions. At the end of each session, the participants acquired ideas about applying Universal De-

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sign in Architectural Design/ Planning. The participants also received the basic idea of Accessibility Audit as a predecessor for Architectural Design. Figure 3 and 4 shows some glimpses from the 'virtual interactive platforms'.

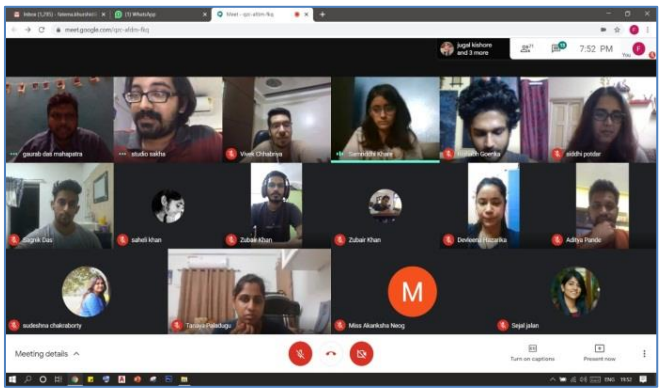

Figure 3.

Figure 4.

Figure 3: Screenshot of Session on Day 2 from the Summer Studio by Studio Sakha, Nagpur, India from 25-28 June, 2020 [Author: Top left] (Source: Author)

Figure 4: Screenshot from the Workshop by Rajalakshmi School of Architecture, Mevalurkuppam, India on 6 October 2020 [Author: Top left] (Source: Author)

3.1.1 Observation and Analysis

To further analyze the aforementioned points related to workshop learning, Authors created a 'Google Form'[38] questionnaire for the participants at the end of each session. The questionnaire inquired about certain aspects of Universal Design: (a) Position of Universal Design in the design domain, (b) Prioritization of Site & Services in Universal Design, (c) Rating National policies, (d) Level of difficulty in Universal Design scenario in old cities, (e) Position of 'Transportation' and 'Accessible Information' in Universal Design domain, (f) Difference in Universal Design scenario between old and new cities, and (g) Need of 'Rating System'. The questions typology ranged from Multiple Choice Questions, Dichotomous Questions[39] and Likert Scale[40] based. The total number of respondents in this Google Form questionnaire was 310.

79% of the respondents prioritized Universal Design, and not Barrier-Free Architecture or Inclusive Design, in the field of Architecture and Planning *[Refer to Figure 5].*

The respondents' priority in Universal Design in the Indian context is Services (prioritized by 46%), followed by Site (prioritized by 42%) *[Refer to Figure 6].* A significant number (63%) of respondents advocated for different Universal Design guidelines/ principles/ audit formats, in old and new cities *[Refer to Figure 7].*

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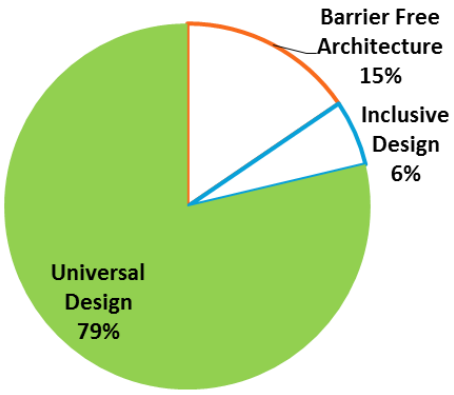
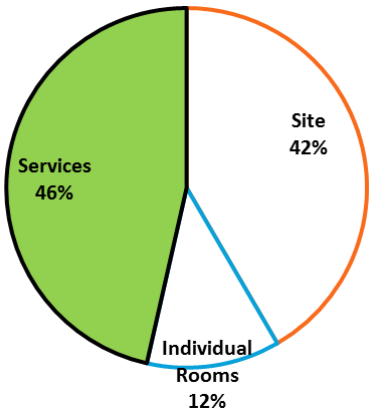


Figure 5.



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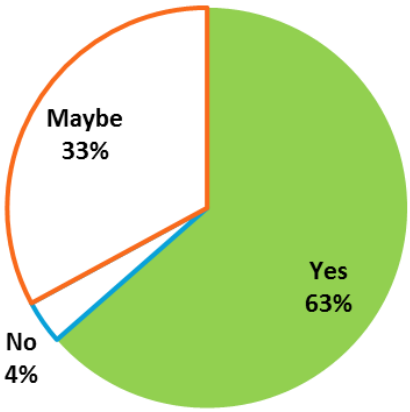

Figure 7.

Figure 5. Most significant aspect in Architecture & Planning (Source: Author)
Figure 6. Preferred first rank of importance for the components in Universal Design in the Indian context: a) Site, b) Individual Rooms (individual interior spaces), & c) Services (Source: Author)
Figure 7. Do we need different Universal Design guidelines/ principles/ audit formats for old cities and new cities in India? (Source: Author)

Majority of the respondents stated that accessibility and Universal Design scenario in old core cities of India are difficult to impart *[Refer to Figure 8]*. Other than 8.07% of the respondents, all others specified a difficulty level of 5 or more on a Liker scale of 1-10 (where '1' is least difficult and '10' is most difficult).

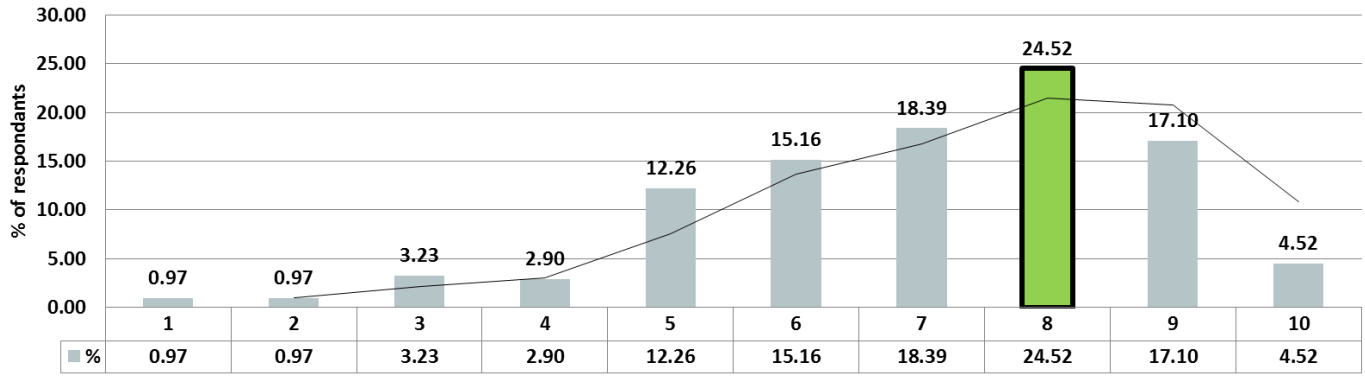

Figure 8. How difficult is it to impart the accessibility and Universal Design scenario in old core cities of India? (1-least difficult; 10-most difficult) (Source: Author)

Majority of the respondents also affirmed Accessible India Campaign as of satisfactory status *[Refer to Figure 9]*. 7.42% of respondents scored it less than five on a Liker scale of one to ten (where one is least marked and ten is highest).

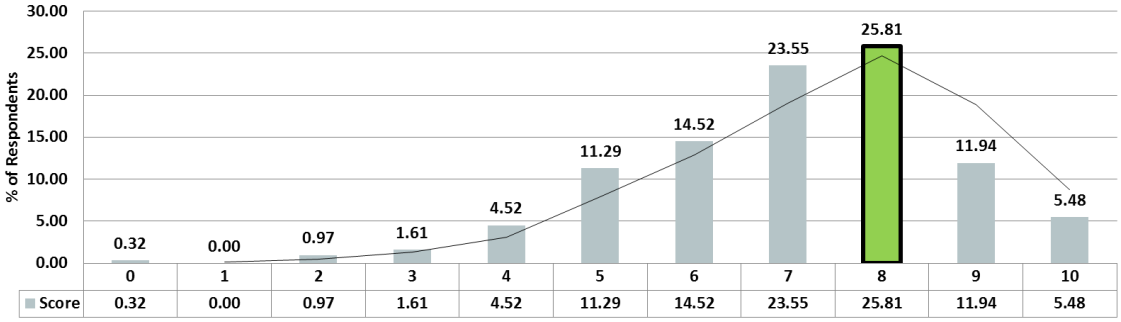

Figure 9. How much do you rate 'Accessible India Campaign' in terms of Universal Design and Accessibility (0-least; 10-highest) (Source: Author)

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Out of the three components of Accessible India Campaign, (i.e. Built Environment Accessibility, Transportation System Accessibility, and Information and Communication Eco-System accessibility), the respondents prioritized Transportation System Accessibility. Thus, Transportation requires accessible and Universal Design features more than other segments of urban life. During this survey, 97.10% of the respondents also stated that like 'Green Rating'[41] in Sustainable Architecture[42], a customized rating system in Universal Design is required as well.

3.1.2 Findings and Discussion

The pan-India data collected from the survey through Google Form questionnaire explicated certain aspects of Universal Design in the Indian context. Involvement of Indian design fraternity made the study more fruitful, since these are the people who spread the awareness of Universal Design. Table 2 shows a summary of the learning from this exercise.

Table 2. Learning from the interactive sessions in India between June-November 2020, for substantiating the aim of the research (Source: Author)

S.No	Topic	Learning
1	Importance of Universal Design in Architecture and Planning	Unlike a few decades back, Barrier Free architecture and Inclusive Design are relatively outdated. The present need for India is Universal Design.
2	Prioritization of site level and services in Universal Design	Universal Design is necessary, and within it, 'SITE & SERVICES' should be the priority. However, the focus of all existing Indian guidelines is 'Building Specific' or rather, towards Individual room.
3	Differences in accessibility scenario between old core cities and new planned cities, in India	In India, new cities & old cities need different Universal Design guidelines; calling for criticism of the latest national policies.
4	Level of difficulty in old core cities in India	Different Universal Design guidelines are required for old and new cities due to their differences in Spatial Evolution/ Temporal Growth, Institutional mechanism, Infrastructural pattern, and Demographic reasons.
5	Impact of present national campaigns towards inclusive planning	Although National Policies are satisfactory, initiating a case specific approach or a flexible assessment pattern is ideal.
6	Position of 'Transportation' and Accessible Information' in Universal Design	Pan-India, accessible transportation is an issue. Instead of focusing on Building or Technology oriented accessibility, the Government should focus on making the transportation system accessible. In infrastructural terms, accessible streets and accessible mobility is needed.
7	Need for customized rating system in Universal Design	A new "Rating/ Indexing" system in Universal Design makes the Universal Design scenario more quantitative in analytical terms. Thus, the scope for intervention in infrastructural terms based on the data derived from rating systems might be used for promoting inclusiveness.

Each of the learning as mentioned in Table 2 shall form the basis of further investigation for respective focus area.

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3.2 People's Perception in an old city regarding walkability and mobility

After, gathering the Indian design fraternity's opinion, the authors conducted a survey for accessing people's perception about walkability and mobility, involving people from Kolkata. Kolkata, besides being a colonial[43] city is also nearly 350 years old (Mahapatra, Reinterpreting Urban Fabric in Cities with Living Heritage: The Case of Central Kolkata, 2020).

Thus, Kolkata serves as an ideal case for studying the people's perception of mobility in an Indian old city. Authors collected samples over a period of five months from 17th July 2020 till 2nd November 2020, via face-to-face and online mode[44].

The intention of this survey was to cognize: (a) The frequency and purpose of outdoor mobility, (b) People's perception of a Public Transportation system, (c) Status of walkability, and (d) Awareness about national campaigns.

3.2.1 Data Analysis

Considering the aforementioned intentions, Authors prepared a Google Form questionnaire[45]. Like the previous Google Form in case of 'Opinion of Design Fraternity in India', the questions in this survey also ranged from Multiple Choice Questions, Dichotomous Questions, and Likert Scale based. The total number of respondents for this survey was 125 which were acquired from 40 wards[46] within Kolkata Municipal Corporation[47] limits.

Mr. Deoraj Pande (resident of Ward 44; aged 74) goes out for his house daily work in spite of his severe arthritis; however, prefers using private transport for commuting. Mr. Barid Baran Mahaty (resident of Ward 48; aged 58), a 'Person with Disability' (PwD) cardholder, prefers using local trains over any other means of public transport. Mrs. Kanaklata Chakraborty (resident of Ward 50; aged 76), another PwD cardholder, expressed her grief regarding the difficulty in identifying address which gets aggravated due to her partial blindness. Mrs. Dugarani Chaudhury (resident of Ward 45; aged 96) has been under restricted movement for last two decades and avoids public transport in case of occassional outings. Mr. Prasanta Das (resident of Ward 48; aged 61), who received a PwD card after becoming mobility impaired, mentioned the dilapidated condition of streets. Difficulty in the waiting facility in public transportation has been identified as an alarming situation by Mrs. Manisha Roy (resident of Ward 43; aged 72), Mr. Ram Adhikari (resident of Ward 49; aged 67) and many others.

After taking such opinion from respondents, the authors filled the Google Form for them. Authors involved one local architecture student[48] and a retired municipal worker from Kolkata[49] in their survey for better communication with locals. Respondents became more vocal about their issues and problems when communicated in the local language by local people, than during formal Google-form based interview. A bilingual survey format was also used for communicating with locals and their comments were noted in Bengali [50]*(shown in Figure 10)*; which was later translated into English, at the 'Laboratory of Architectural Planning'[51] at Hokkaido University.

The last survey titled 'Opinion of Design Fraternity in India' indicated Universal Design as the need of Indian design scenario. Universal Design encompasses the need for a diverse group. Thus, in spite of focusing on elderly and differently-abled people, authors collected samples from all categories.

Out of the 125 respondents, 48% of the respondents were male, 50.40% were female, and one respondent belonged to the third gender. However, in terms of age groups, the focus was on the senior citizen *[Refer to Figure 11]*. 33.60% of the respondents belonged to the age group of sixty years or above sixty years, 28.80% from the age group between twenty and thirty-five years, 20.80% from the age group between fifty and sixty years, 16% from the age group between thirty-five and fifty years, and 0.80% from the age group of ten years or below ten years.

Out of the 125 respondents, 83.20% were able-bodied and 16.80% were differently-abled. Out of the 16.80% differently-abled people, only 3.2% of them possessed a

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'Person with Disability card'[52]. Thus 3.2% of the respondents were 'medically' recognized 'disabled' or differently-abled, which is above the national percentage of 2.21%.

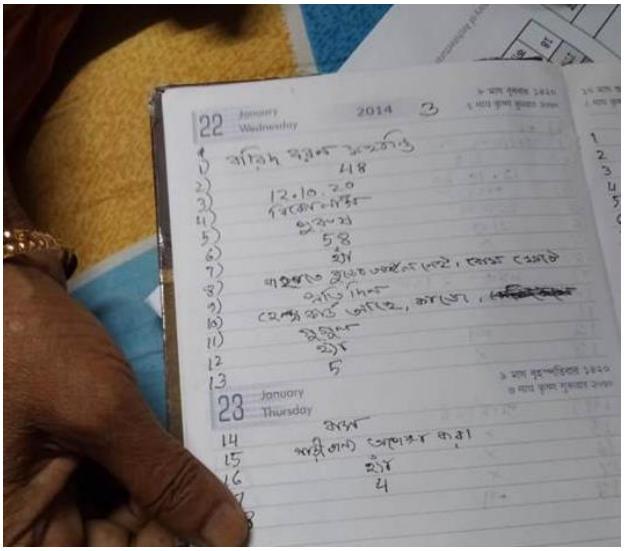

Figure 10.

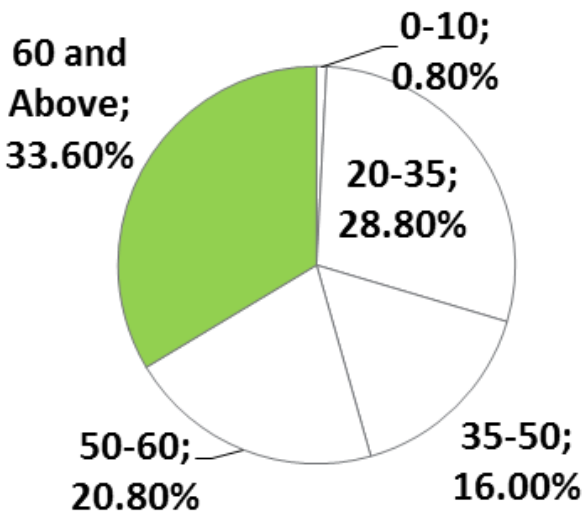

Figure 11.

Figure 10. Notes were taken in Bengali and later translated into English (Source: Author)
Figure 11. Composition of the respondents in terms of Age (Source: Author)

The types of medical issues that the respondents were facing are: (a) Low vision, (b) Locomotor Disability, (c) Arthritis, (d) Asthma and (e) Terminal Illness (Cancer). Table 3 elaborates the type of disability and recognition status as per 'Right to Persons with Disabilities Act, 2016'.

Table 3. Types of respondents' Disabilities (Source: Author)

S. No	Type of Disability	Recognized by 'Right to Persons with Disabilities Act, 2016'	Number of Respondents	Percentage of Respondents
1	Low Vision	Yes	6	28.57
2	Locomotor Disability	Yes	11	52.38
3	Arthritis	No	2	9.52
4	Asthma	No	1	4.76
5	Cancer	No	1	4.76

Hereafter, 'senior citizen and differently-abled people' are paired in a single group and compared with 'able-bodied people under the age of sixty'. The 'senior citizen and differently-abled people' are referred to as 'Category B' and 'able-bodied people under the age of sixty' are referred to as 'Category A'. The total number of 'able-bodied people under the age of sixty' was 74, which is 59.2% of the total respondents. The total number of 'senior citizen and differently-abled people' was 51, which is 40.8% of the respondents. For the rest of the discussion about 'People's Perception in an old city about walkability and mobility', the 'senior citizen and differently-abled people' are referred to as 'Category B' and 'Able-bodied people under the age of sixty' are referred to as 'Category A'.

- Frequency and purpose of going out

First, the authors asked the respondents about the respondents' frequency of going out of their house. Only 50.98% of 'Category B' ventured out of their houses on a daily basis, in comparison to 75.68% of 'Category A'. Likewise, the 'weekly', 'monthly', and 'yearly' rate of going out was more in 'Category B' as compared to 'Category A'. Figure

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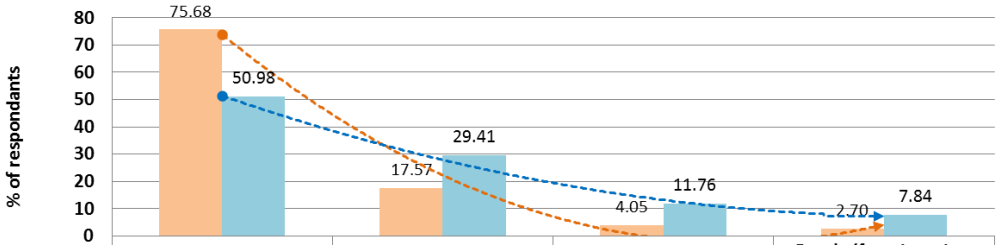
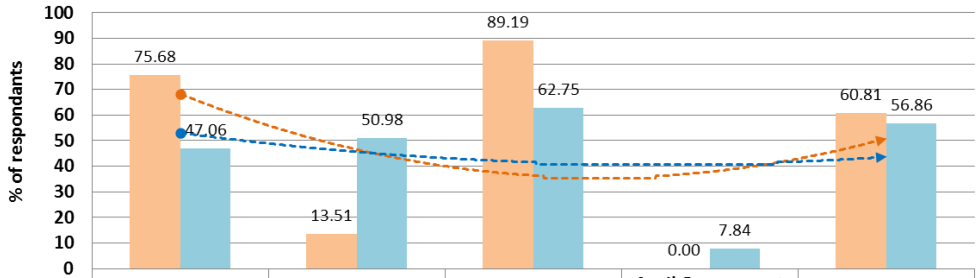
12 shows the options selected by both 'Category A' and 'Category B' regarding their frequency of going out of individual houses.



	Daily	Few times in a Week	Few times in a month	Rarely (few times in a year)
Category A: Able Bodied (<60 years) %	75.68	17.57	4.05	2.70
Category B: Senior Citizen and/ or Differently Abled %	50.98	29.41	11.76	7.84

Figure 12. Frequency pattern of going out of the house, among different user groups (Source: Author)

After determining their frequency pattern of going out of their house, the authors questioned respondents about their purpose of going out. The options provided were: a) Professional/ academic, b) Medical reasons, c) Social gathering, d) Availing Government benefits (like health card), and e) Daily household work. The respondents could choose all the options that were applicable. Figure 13 shows the options selected by both 'Category A' and 'Category B' in relation to their purpose of going out of individual houses. Both 'Category A' (89.19% of them) and 'Category B' (62.75% of them), mentioned 'social gathering' as their most sought after reason for going out of the house. Respondents from 'Category A' showed a higher share (75.68%) compared to 'Category B' (47.06%), in going out of the house for professional or academic purposes. 'Category B' showed a higher share (50.98%) compared to 'Category A' (13.51%) in medical-related outings. No respondent from 'Category A' went out of the house for availing Government benefits (like health card). A remarkable 56.86% of 'Category B' went out of the house for daily household works, in comparison to 60.81% of 'Category A'.



	Profession/ Education	Medical Reasons	Social Gathering	Avail Government Benefits (like health card, etc)	Daily Household work
Category A: Able Bodied (<60 years) %	75.68	13.51	89.19	0.00	60.81
Category B: Senior Citizen and/ or Differently Abled %	47.06	50.98	62.75	7.84	56.86

Figure 13. Purpose of going out of the house, among different user groups (Source: Author)

- Searching/ Identification of an address

Next, the authors discussed street-level cognition with the respondents. The question was how the respondents usually search/ identify an address. The options provided were: (a) Using online services like Google maps, (b) Asking people on the streets, (c) Identifying landmark (like a nearest junction or, old tree or, famous temple), and (d) Referring to street signage. Although people in urban areas frequently use all the aforesaid options, the authors asked respondents to mention their most preferred option. Figure 14 shows the options selected by both 'Category A' and 'Category B' in relation to their preferred options while searching/ identifying an address. Majority of respondents from

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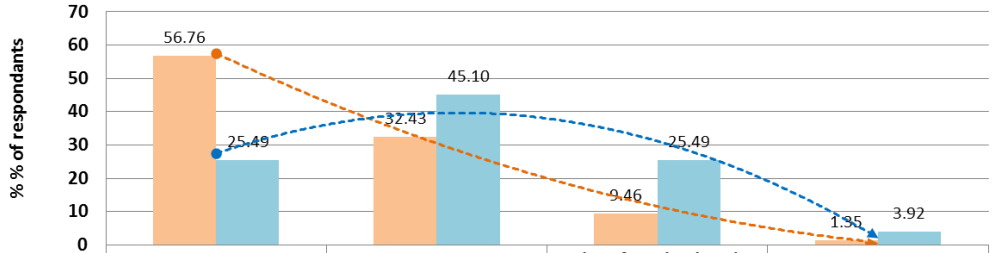
'Category A' (56.76%) preferred 'online services' to identify/ search an address. In response, the majority of respondents from 'Category B' (45.10%) choose 'asking people on the streets'. Respondents from both the categories showed noticeably less dependence on referring street signage, with 1.35% of respondents from Category A and 3.92% of respondents from Category B. More respondents from 'Category B' (25.49%) preferred 'Identifying landmark (like the nearest junction or, old tree or, famous temple)' as their means to identify an address, in comparison to only 9.46% of respondents from 'Category A'.



	Using online services like Google maps, etc	Asking people on the street	Identifying landmark (like nearest junction, old tree, famous temple, etc.)	Referring Street Signage
Category A: Able Bodied (<60 years) %	56.76	32.43	9.46	1.35
Category B: Senior Citizen and/ or Differently Abled %	25.49	45.10	25.49	3.92

Figure 14. Preference in the identification of an address (Source: Author)

- Public Transportation

Perception of people in public transportation was the next topic of investigation. For this purpose, respondents from both the 'Category A' and 'Category B' were primarily asked if they use public transport. If the respondents did not use public transport on a daily basis, frequent or periodic usages were also taken into consideration for data input. 54.90% of the respondents from 'Category B' used public transport, in contrast to 78.38% of respondents from 'Category A'. The respondents from both categories who do not use public transports are either having their own mode of transport (like four-wheeler or two-wheeler), or having designated vehicle from their place of work, or are dependent on rental cab services; for example Uber, Ola, and Rapido.).

Thus, for further study on the topic of public transportation, authors considered only 78.38% from 'Category A' i.e. 58 respondents, and 54.90% from 'Category B' i.e. 28 respondents.

The authors asked these respondents about their comfort level in using Public Transportation. A Likert scale approach was undertaken for this purpose and respondents rated their comfort level on a scale of one to ten. Score one signifying lowest comfort and score ten signifying most comfort. The weighted mean score is 5.39 for 'Category B' in comparison to 6.17 for 'Category A'.

The next question was about modal preference. The authors asked these respondents for specifying which mode of public transport in their city the respondents often used. The options provided were: (a) Bus, (b) Tram, (c) Metro Rail, (d) Local Train, (e) Auto Rickshaw, and (f) Cycle/ Hand-pulled rickshaw. Kolkata having a multiplicity of transport mode and well-connected transportation network encourages its residents for using multiple modes in a single origin-destination route. However, the authors asked respondents to mention the mode which they used most. Figure 15 shows the options selected by both 'Category A' and 'Category B' in relation to their most preferred public transportation mode. Respondents from both 'Category A' (48.28% of respondents) and 'Category B' (67.86% of respondents) mentioned Bus as their most preferred mode of public transportation. Tramway, often referred to as the heritage of Kolkata, was not given any preference by either category of respondents. Preference of Metro Rail was comparatively similar in 'Category A' with 18.97% of the respondents and 'Category B' with 14.29%. However, 10.71% of respondents from 'Category B' preferred local train, in

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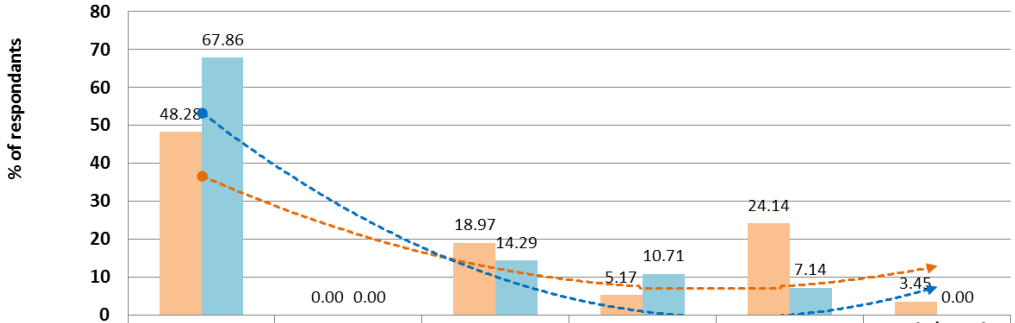
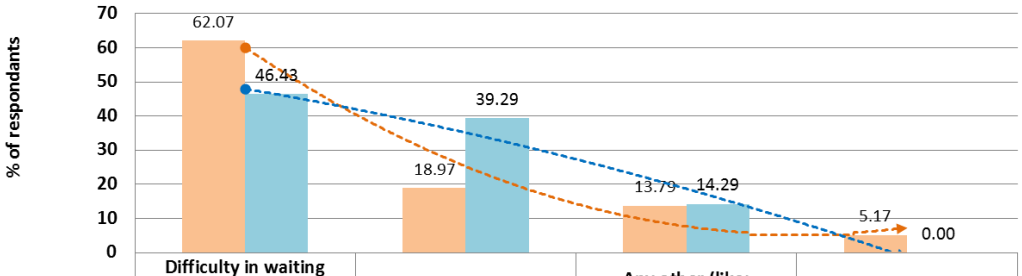
comparison to only 5.17% of respondents from 'Category A'. 24.14% of respondents from 'Category A' and 7.14% of respondents from 'Category B' preferred auto-rickshaw respectively. Although 3.45% of respondents from 'Category A' choose Cycle/ Hand-pulled rickshaw as their preferred mode of public transport, none of the respondents from 'Category B' opted for this.



	Bus	Tram	Metro Rail	Local Train	Auto Rickshaw	Cycle/ Hand Pulled Rickshaw
Category A: Able Bodied (<60 years) %	48.28	0.00	18.97	5.17	24.14	3.45
Category B: Senior Citizen and/ or Differently Abled %	67.86	0.00	14.29	10.71	7.14	0.00

Figure 15. Preference in the usage of Transportation mode (Source: Author)

The last question in the category of Public Transportation was identifying the problem in accessing public transportation, by individual respondents. For this question, the authors asked the respondents for choosing any one option from the following, as their major problem in accessing public transportation: a) Difficulty in the waiting facility (a poorly designed bus stop or, improper visual notification), b) Reaching Public Transport from home, c) Any other (like Congestion or, Misbehaviour by co-passengers), and d) Fare. Figure 16 shows the options selected by both 'Category A' and 'Category B' in relation to their major problem in accessing Public Transport. Majority of respondents from both 'Category A' (62.07%) and Category B' (46.43%), stated 'Difficulty in the waiting facility (like a poorly designed bus stop or, improper visual notification),' as their major problem in accessing public transport. The second preference for respondents from both categories (Category A: 18.97%; Category B: 39.29%) was the issue of 'reaching the public transportation from individual homes'. Relatively similar share both the categories, 13.79% respondents from Category A and 14.29% from Category B, selected 'Any other (like Congestion or, Misbehaviour by co-passengers)'. Although 5.17% of the respondents from Category A mentioned 'Fare' as their reluctance towards accessing Public Transport, no respondents from Category B choose this option.



	Difficulty in waiting facility (like: bus stop, improper visual notification, etc)	Reaching the Public Transport from home	Any other (like: Congestion, Improper Crowd, etc.)	Fare
Category A: Able Bodied (<60 years) %	62.07	18.97	13.79	5.17
Category B: Senior Citizen and/ or Differently Abled %	46.43	39.29	14.29	0.00

Figure 16. Difficulty in accessing Public Transportation (Source: Author)

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- Walkability

After acquiring ideas about public transportation, the authors investigated 'walkability' from all 125 respondents (74 from Category A and 51 from Category B). Only 74.51% of the respondents from Category B walk/ access the streets, in comparison to 93.24% of able-bodied people. The people who do not walk are the ones with a constant source of a private vehicle or, having medical issues or, are dependent on others for their transportation. For the next question, authors considered only that 93.24% from 'Category A' i.e. 69 respondents, and 74.51% from 'Category B' i.e. 38 respondents.

The next inquiry in the walkability segment was related to the respondents' comfort level during walking on the streets. Using a Likert scale approach, the respondents rated their walkability experience on a scale of one to ten. Score one signifying lowest comfort and score ten signifying most comfort. The weighted mean score is 4.92 for 'Category B' and 5.0 for 'Category A'.

- Awareness about National Schemes

Authors asked all the 125 respondents about their awareness about the existing national policies/ initiatives related to accessibility and Universal Design, the latest of which being 'Accessible India Campaign' or 'Sugamya Bharat Abhiyan'. 92.16% of the respondents from Category B did not hear about Accessible India Campaign, in comparison to 85.14% of able-bodied people.

3.2.2 Findings and Discussion

The data collected by interviewing 125 people from forty wards of Kolkata Municipal Corporation helped in assessing people's perspective in the domain of universal mobility. The term 'Universal Mobility' was not used during the interview; however, the authors posed the questions in a strategic pattern for assessing the scope of Universal Mobility. The four sets of inquiries as discussed in Section 3.2.1 portray an overall negative picture in the domain of mobility. Table 4 shows a summary of learning from the responses recorded by the authors during this survey.

Table 4. Learning from the interview sessions in Kolkata, India between July-November 2020, for substantiating the aim of the research (Source: Author)

S.No	Topic	Learning
1	Frequency and purpose of going out	• Health-related issues outside the preview of "registered" disabilities need recognition for availing health benefits. In any case, people with disabilities/ senior citizen venture out daily. The rates of going out daily in Able-bodied are more than their counterpart. • Senior Citizen/ Differently-abled People have a higher rate of social gatherings than other purposes; hinting towards a need of promoting 'sociable streets and public environment' which is in coherence with United Nations Sustainable Development Goals. • Since old cities usually contain all the types of building use (as per occupancy), mobility corridors require equal or equivalent importance.
2	Searching/ Identification of an address	• The affinity of Senior Citizen/ Differently-abled People to rely on "asking people on the streets", is hinting towards the need for inclusive streets which not only enables but empower them. • The need for improving street signage (visual & auditory). • The domain of 'online search' in terms of Google Maps can be improved by adding 'accessibility' layer prepared by Architectural Planning only. • In spite of being developed on the British planning principle, the lack of 'landmarks'

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		shows the complexity in the urbanscapes, which can be addressed by introducing street elements as new icons of the urbanscape.
3	Walkability	• Dissatisfaction towards the use of public transport is due to: 1) Poor provision from state/ central governments in the field of urban transportation, and/ or 2) Better services from private players; for example Uber, Ola, and Rapido. • The major transport mode is 'Bus' and multiple locations are present for the bus to halt briefly. However, 'bus stop' or 'bus shelter' was scantily present. Clearly, the survey explains the need for prioritizing bus-related accessible infrastructure before developing any other modes. • The prioritization in the proposal for developing 'Urban Accessibility Facility' can prioritize in the topic of improving the 'waiting facility' for bus and likewise. • The target for architects and planners should be facilitating the waiting time and emergency requirements especially for elderly and differently-abled. • The reason for the underutilization of Para-transits can be dealt with in a separate survey.
4	Awareness about National Schemes	• A large percentage of walkability in spite of dissatisfactory pedestrian facilities proves that in developing countries, infrastructure is less considerable than daily need. • When people commute in spite of poor infrastructure, the marginalized users are compromised. • Relating to the fact that people are unaware of national policies and unknown about the scopes of better design, the motto of this research is: 'To create a market for the design, rather than designing for the market'.

3.3 Visual observation of an old city core

Taking indications from the survey involving 125 people from Kolkata, a stretch located within the core of Kolkata was selected by the authors for further investigation. The focus of this exercise was assessing the universal mobility conditions in the old core of Indian cities. A visual survey for the selected stretch was conducted in the month of September and November 2020. The selected stretch is a part of Bipin Behari Ganguly Street[53]. In the master plan[54] of Kolkata, the land use for this area is demarcated as 'Mixed Use'[55] (Nag, 2010).

The selected stretch is observed in multiple old cartographic evidences of Kolkata since 1785 CE; as shown in Figure 17.

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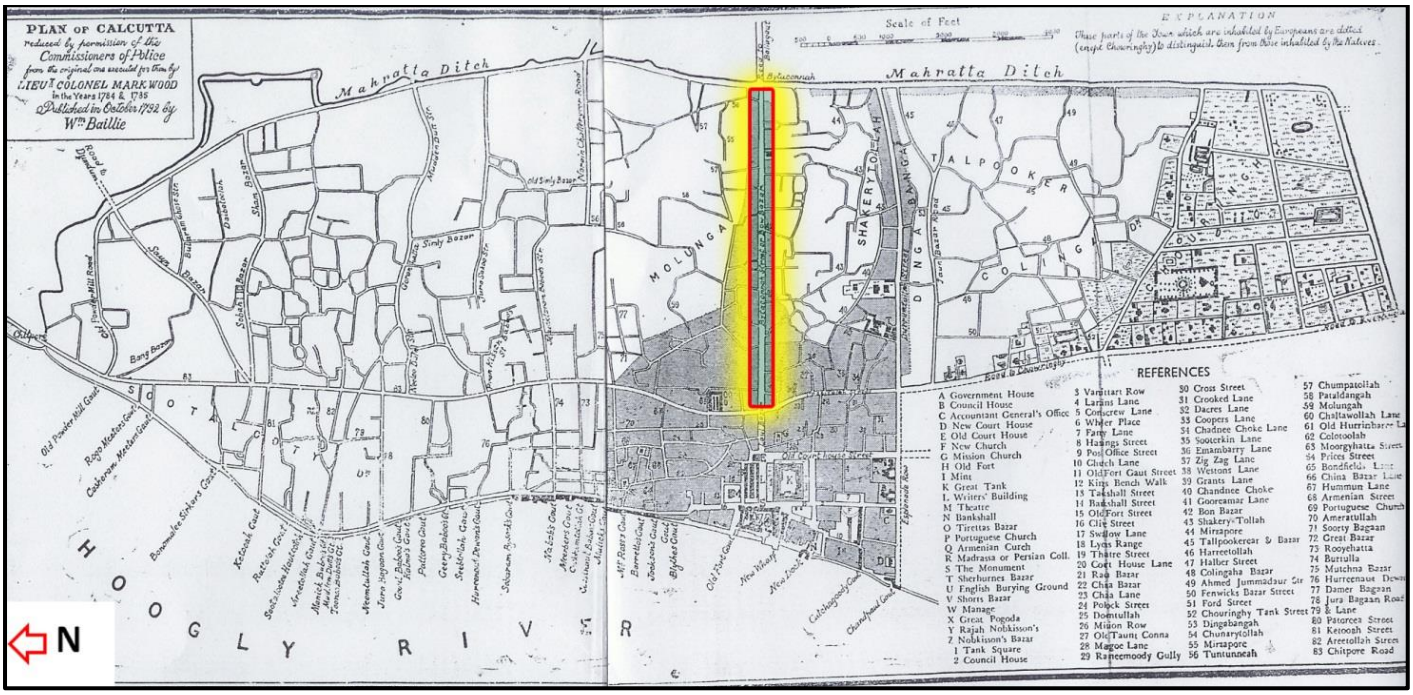

Figure 17. Map of Kolkata (Calcutta) by Lt. Col. Mark Wood in 1785; the study stretch selected for the visual survey is demarcated is highlighted. (Source: Harvard Library Online)

3.3.1 Visual Survey

Authors selected a part of the 300-year-old stretch (shown in Figure 17) for the visual survey. This stretch has undergone minimum temporal change due to its historic nature. The stretch is further shown in Figure 18, where 'A' and 'B' are starting and ending point of the study stretch respectively. Point A is Bowbazar Crossing and Point B is Bentinck Street Crossing.

In the policy document for 'Accessible India Campaign', the component of 'Transportation System Accessibility' has the objectives of enhancing proportions of: (a) Accessible airports, (b) railway stations, and (c) public transport. The part of Kolkata which is being proposed for the Research, does not have an airport, however, there is a Railway Station and multiple Underground Metro Rail Stations. Further, there are multiple modes of other transport available here, including: (a) Tramways, (b) Bus, (c) Auto, (d) Hand-pulled rickshaw, and (c) Taxi/Cab. In the city land-use master plan, this area of Kolkata is demarcated as mixed land use zone. The stretch predominantly consists of buildings with multiple uses, mostly residential buildings clubbed with business/ commercial establishments. However, buildings with institutional, educational, assembly, mercantile, and storage uses were also present. Moreover, a substantial number of buildings in this stretch were heritage buildings *[refer to Figure 19]*.

Multiplicity in building use causes heavy pedestrian footfall throughout the day in this stretch. Thus, this stretch serves as a suitable location for a visual survey for the assessment of mobility conditions in an old Indian city. A social worker from Kolkata assisted the authors in identifying issues from a local perspective. The photographs taken during the visual survey were later interpreted at the Laboratory of Architectural Planning, Hokkaido University. Figure 20 to 30 illustrates how the stretch is unfavourable for universal mobility.

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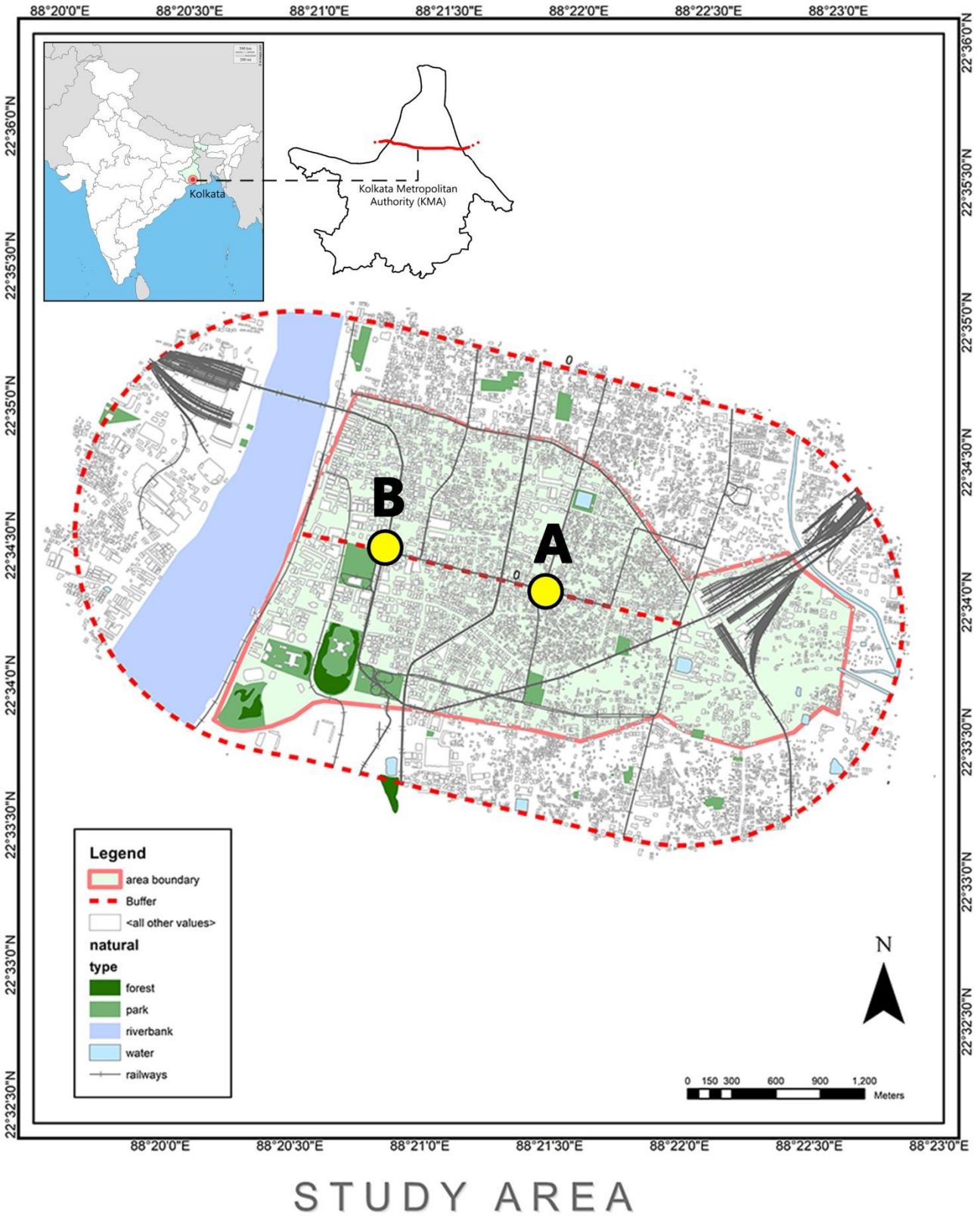

Figure 18. The location for Visual Survey (between point A and B); Map prepared in ARC-GIS (Source: Author)

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Figure 19. Mercantile Building (centre) built in the early 1900s: an example of built heritage (Source: Author)

3.3.2 Observation and Analysis

The distance between Point A and Point B (as shown in Figure 18) is 850 m, and it takes about fourteen minutes for an able-bodied person for covering the distance. The stretch oriented in North-East to South-West direction has eighteen junctions[56] of different scale[57]. Authors conducted observational walks along this stretch and captured the photographs. Authors recorded observations at various intervals of the day at: (a) 1300 hours, when school gets over, (b) 1800 hours when offices close for the day, and (c) 2100 hours when commercial establishments shut down for the day. The observations made by the authors are explained hereafter.

Unorganized informal vending and encroachment by existing establishments occupied nearly every street *[refer to Figure 20 and Figure 21 respectively]*. Complemented by this, numerous beggar/ homeless people were occupying a share of the pedestrian space (often near non-operating Metro rail gates) *[refer to Figure 22]*. Communal open baths, which were a scene from yesteryear, were also present in certain areas *[refer to Figure 23]*. A mix of Hindu, Muslim and Christian religious places were present in the stretch *[refer to Figure 24]*. In terms of transportation, the bus stops were in poor infrastructural condition *[refer to Figure 25]*. Informal vendors used the railings along the footpath for their personal use *[refer to Figure 26]*. Additionally, the Kerb along the footpaths was in dilapidated condition *[refer to Figure 27]*. Informal parking was observed in almost the entire stretch *[refer to Figure 28]*. Lack of signals at crucial intersections created chaos, especially during peak hour traffic, as depicted in Figure 29. Poor functioning of street lights was observed at multiple locations like the one photographed in Figure 30.

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Figure 20.

Figure 21

Figure 22

Figure 23

Figure 24

Figure 25

Figure 26

Figure 27

Figure 28

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Figure 29

Figure 30

Figure 20. A cobbler occupying footpath stretch along the external wall of Bowbazar Post Office (Source: Author)
Figure 21. The shop on the left of the picture is using their products for display, on the pedestrian space (Source: Author)
Figure 22. Homeless people sleeping on the streets (right) and also at the unused entrance of Gate 4 of Central Metro (Source: Author)
Figure 23. Open Public Bath still in operation at Bentick Street; also capturing a part of the footpath as well as disturbing the vehicular stretch (Source: Author)
Figure 24. Almost 500-year-old temple 'Firinghi Kali Bari' a place where Hindus gather during prayer (Source: Author)
Figure 25. A bus stop between Central Avenue crossing and Bow street. Bedding of homeless is above the seating area (Source: Author)
Figure 26. Railing near Gangadhar Babu Lane used by vendors as an edge for their storage (Source: Author)
Figure 27. Entrance to Bibi Rozio Lane, showing poor kerb and drainage conditions (Source: Author)
Figure 28. Informal parking of private and commercial vehicles consumes at least 25% of the available pedestrian space in Kenderdine Lane. Residents use extended plinths from heritage buildings as shaded seating space. (Source: Author)
Figure 29. The entrance of Phears Lane during evening peak hour. A multiplicity of transport modes, absence of signals and improper pedestrian facilities creates a chaotic environment. (Source: Author)
Figure 30. Poor lighting conditions in a stretch between New Bowbazar Lane and Kenderdine Lane (Source: Author)

3.3.2 Findings and Discussion

The visual survey helped the authors in finding certain issues in basic mobility which requires thorough examination before interpreting universal mobility. Table 5 shows the observations from this visual survey. 'Universal Mobility' can be interpreted for this stretch only after assessing minimum mobility standards. Thus, these observations are the first stage for apprehending the mobility issues in this stretch.

Table 5. Learning from the visual survey in Bipin Behari Ganguly Street in Central Kolkata, India between September-November 2020, to assess the universal mobility conditions (Source: Author)

S.No	Topic	Inference
1	Predominant Building Use	The mixed land use and multiplicity of usage in a single building creates a complex structure of users. A different activity like educational, business and others create multiple 'peak hour traffic' which the present infrastructure is not adequate to cater.
2	Heritage Buildings	A large number of Heritage buildings fostered low temporal change and is also restricting alteration in the width of carriageways. Typical heritage buildings with no setback and footpaths are not segregated from the building entrances creates a pedestrian discomfort in this stretch.
3	Informal Vending	Since the inception of this stretch, the informal vending has been a characteristic feature. However, with increasing population and vehicular pressure, the informal ven-

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		dors are presently a threat to mobility.
4	Encroachment	Encroachment is a policy failure. Illegally occupied spaces within footpath creates severe problem during peak hours.
5	Beggar/ Homeless/ child labour	Beggar/ Homeless/ Child labour is social issues. Only socio-political intervention can facilitate the process of emptying the streets of these user groups.
6	Communal Open bath	Communal open baths are obsolete in most parts of the city except central part of Kolkata. These communal open baths (often at the edge of footpath and street) serve as an important functional social infrastructure due to the presence of many daily wage workers and floating population. On the contrary, the baths are posing threat to mobility on both footpath and street. The common baths create an extra crowd and spilt water, both of which are threatening to the pedestrian environment.
7	Religious establishments	Being an organically developed area, Hindu, Muslim and Christian crowd are proportionately present. The 'Firinghi Kali Bari' Temple and 'St. Xavier's Church' are examples of religious structures. The problems with these locations are their presence along the footpath and absence of alternative entry. So, during prayers hours, a conflict in pedestrian movement due to different user group at the same line of movement is observed.
8	Bus Stop	The bus stops are in dilapidated condition and used by homeless people to store their belongings. Provision of information display is absent in bus stops; rather, the bus stops are used for advertising purposes. A bus stop without facilities and improper information display is of seldom use in the 21st century.
9	Metro Stations	The unused metro station gates are occupied by homeless people as their temporary shelter. These issues are to be solved at the policy and socio-political level.
10	Signalized intersections	Allocation of signals at intersections in this stretch was done decades ago in this stretch. The new zones of pedestrian and vehicular traffic have not been considered in the recent past. Due to different building use, the volume of traffic is varying. The concept of allocating signals based on road width might not be suitable for this area. Rather, signals based on traffic volume and predominant building use are apt for this stretch.
11	Railing	Informal vendors occupied the railings in most parts of the stretch. Neither a clear demarcation for the pedestrian and vehicular traffic, nor scope for elderly/ differently-abled people who needs to hold the railing, is present. A clear edge is essential for an ideal streetscape.
12	Kerb	Kerb which essentially provides gradation in street-level mobility is in extremely dilapidated condition in this stretch. As a result, neither able-bodied pedestrian nor, differently-abled people, are able to move freely in the footpaths. The scenario worsens at night due to lack of adequate light.
13	Storm water drains	Storm water circulation in this part of Central Kolkata is better than most of the parts, however, the location of storm water drains are a matter of major concern. The location, grating style and the slope is dangerous for pedestrian, especially the ones with walking cane.
14	Signage	There was no directional signage in the entire stretch. Public utilities are not demarcated. The historic buildings had their description engraved near the entrance. However, other places of public interest are not having any information. Thus for people

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		new to this area and people with cognitive issues face difficulty in traversing the stretch.
15	Public Toilet, Drinking water facilities, and resting facilities	Only one public toilet was observed In the entire stretch of 850 meters in which visual observation was undertaken, and no drinking water facility was present. Public facilities like drinking water and public toilet, complemented by street furniture are components of a healthy street. Mobility without the public facility is unreasonable in the Urban scenario.
16	Trash Bins	According to the latest 'Swachh Survekshan[58]' programme or Clean India Campaign, Trash bins are to be placed at fifty meters interval. However, in this stretch, hardly any trash bins were observed and as a result, a littering was observed. Clean streets promote increased mobility and should be taken care of.
17	Street Lights	In spite of the fact that street lights are present all throughout the stretch, the requisite lighting intensity was not present. When checked using 'Light meter' application, most of the streets showed a lux level of less than ten, which is not ideal for a safe pedestrian environment. The fact that this stretch experiences a heavy pedestrian footfall, poor lighting creates it even more vulnerable to users with cognitive difficulties.

4. Major Findings

The first objective of this research paper (i.e. To ascertain the need for a new dimension in the Indian accessibility scenario) got substantiated through the first survey (as elaborated in Section 4 Part 1) involving the design fraternity of India. Taking a cue from the first study about the focus area of accessibility in transportation, the next step was exploring the second objective (i.e. what is the people's perception regarding mobility in an Indian old city).

The second objective of this research paper (i.e. To assess people's perspective towards Universal Mobility in core urban areas in India), got verified through the learning from the survey involving the residents of Kolkata (as elaborated in Section 4 Part 2). Once this scenario was clear, the next steps were: choosing a particular stretch in the old core of Kolkata, and conduct a visual observation which would explain a part or whole of the people's opinion regarding mobility in an Indian old city.

The third objective of this research paper (i.e. To identify the issues in mobility in core urban areas in India), got advocated through the inferences from the visual survey of a stretch in the old core of Kolkata (as elaborated in Section 4 Part 3). The observations and inferences through this visual survey indicated that mobility conditions are not in a positive state in this stretch. Basic infrastructural issues are in downtrodden conditions. Thus re-imagining this stretch with Universal Mobility concerns is a difficult task altogether. In order to initiate the process of Universal Mobility features in this stretch, however, a need for further analysis of this stretch was necessary.

Thus it is inferred that the reluctance of people in old cities towards walkability and usage of public transport are directly linked to the poor infrastructural conditions. The historic origin of the old core in Indian cities and their organic pattern of development generate a chaotic urban scenario. Presently dissatisfactory level of cognition at street level, which is not an ideal scenario for able-bodied and differently-abled alike, is persistent. The elderly people additionally, faces problems due to this dilapidated state.

5. Conclusion

In spite of a number of policies and programs related to accessibility at the national level, Indian old cities are often ignored. The reason for this phenomenon is the Indian Constitution. According to Seventh Schedule (Article 246) of the Indian Constitution, 'Land' is a state subject. It implies that a decision regarding urban development is a matter of individual state (G Narayana Raju, 2018). Thus maintaining coherence with

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national policies is a political choice for the Chief Minister of a state. Kolkata is located in the state of West Bengal and the 'state-ruling electoral party'[59] it is not in alliance with the 'central-level ruling party'[60]. Thus, it was not unnatural when 92.16% of the respondents from elderly/ differently-abled and 85.14% from able-bodied people responded during the survey that they have not heard about the Accessible India Campaign.

Thus identifying custom-made access audit format specifically for a particular stretch shall be beneficial for the old core cities, in terms of its practical applicability by avoiding political complications. At the same time, it will also serve a altered guideline for old cities, rather than the generic national guideline. 63% of respondents from the architecture fraternity during the survey mentioned the same suggestion.

As responsible professionals in the field of Architecture and Planning, the authors are taking part in the movement of creating a built environment 'For All'. Built environment 'For All' takes into attention the needs of able-bodied as well as elderly/ differently-abled people. Role of Laboratory of Architectural Planning, Hokkaido University under the supervision of Professor Dr. Mori and Associate Professor Dr. Nomura is specifically noteworthy in this discussion. This laboratory focusses on 'planning architecture' based on 'practical problem interest'. One of the research themes of this laboratory is 'research on the ideal living environments for minorities', with a sub-theme titled 'Environment design that realizes safe and comfortable going out for the physically vulnerable'. This enabled the authors to conduct this research in this laboratory. Moreover, the focus of this laboratory is also in coherence with Goal Number 11 of United Nations Sustainable Development Goals (UN-SDG). The title of the goal 'Sustainable cities and communities' mentions the need to provide: (a) Access to safe, affordable, accessible and sustainable transport systems for all, and (b) Improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons. This goal indicates the need for Universal Design and Universal Mobility, in a global society. In 2020, Hokkaido University collaborated with twenty-seven other Japanese Universities for participation in United Nations University 'Sustainable Development Goals University Platform' (SDG-UP). This platform established by UN-University-Institute for the Advanced Study of Sustainability (UNU-IAS[61]) emphasizes on global development in sustainable terms. Thus, 'Laboratory of Architectural Planning' can prove an essential resource body in assessing the Universal Mobility conditions in old core cities by aligning its research interest with global concerns in the field of Universal Design.

Capacity building and research on Universal Design is an effective tool for creating global awareness about the need of Universal Design in Architecture and Planning (Ostroff, 2003). In similar lines, Ministry of Housing and Urban Affairs, Government of India, in collaboration with- IIT (Indian Institute of Technology) Roorkee, NIUA[62] (National Institute of Urban Affairs) and AIILSG[63] (All India Institute of Local Self Governance) has launched an initiative titled BASIIC (Building Accessible, Safe, & Inclusive Indian Cities). Functionally started in 2020, BASIIC project is supported by the DFID (Department for International Development; now known as 'FCDO[64] or Foreign, Commonwealth & Development Office') fund of UK government. This project aims towards framing Disabled-friendly guidelines and Policy Recommendations that can be implemented through the already functioning Smart Cities Mission (NIUA, 2019). Major objectives of the project include: (a) Training and capacity building of government officials, and (b) Sensitizing citizens of India about the importance of Universal Design. Eminent architects and planners are engaged by NIUA and AIILSG in this project, from the initial stage of preparing posters for Universal Design awareness till final preparation of the course modules. The first author is presently engaged as the Content Curator and one of the Module Development Expert for this project. Unlike previous projects of Government of India, BASIIC project focusses on the concept of spreading awareness on Universal Design through education and research. Thus, in the coming years, accessibility conditions might improve in urban areas.

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The authors believe that sharing knowledge on Universal Design through research and interaction increases the possibility for an inclusive society. Such a society shall ensure the same standard to urban infrastructure for both able-bodied and differently-abled. However, the capacity building alone cannot bring about a radical change in critical Universal Design thinking. Thus authors state that the findings for this paper are comparatively the beginning of a quest towards assessing accessibility in the core city areas in Indian context. For further research in the same domain, a checklist based assessment could be undertaken by interested researchers.

The findings for this paper are comparatively the beginning of a quest towards assessing accessibility in the core city areas in the Indian context. For further research in the same domain, a checklist based assessment could be undertaken by interested researchers. This checklist, as mentioned in the aim for this paper, shall contain the factors for an ideal accessibility audit checklist which is to be used in old core Indian cities. Further research could be based on three distinct lines of action. The three lines of action are: a) Universal Mobility Features, b) Cognitive Factors, and c) Traffic volume. The last survey which was undertaken in Bipin Behari Ganguly Street in Kolkata surfaced issues related to the infrastructural conditions in old core cities in India *[Refer to Figure 19 to 30]*. First, based on these issues, an in-depth analysis of each street and footpath stretches (space between the junction of a street and another) could be conducted for determining the infrastructural level in a quantitative manner. Second, the cognitive factors could be examined and thereby used for determining the linkage between five senses and pedestrian behaviour. However, these two types of study will be incomplete if these studies are not co-related to the traffic volume. The traffic volume, consisting of pedestrian and vehicular volume shall help in assessing the level of service for the study stretch. Figure 31 illustrates the methodology that could be adopted for further study based on the findings of this paper. This further research based on the findings of this paper will foster the preparation of a rating system for Universal Mobility in the core of old Indian cities.

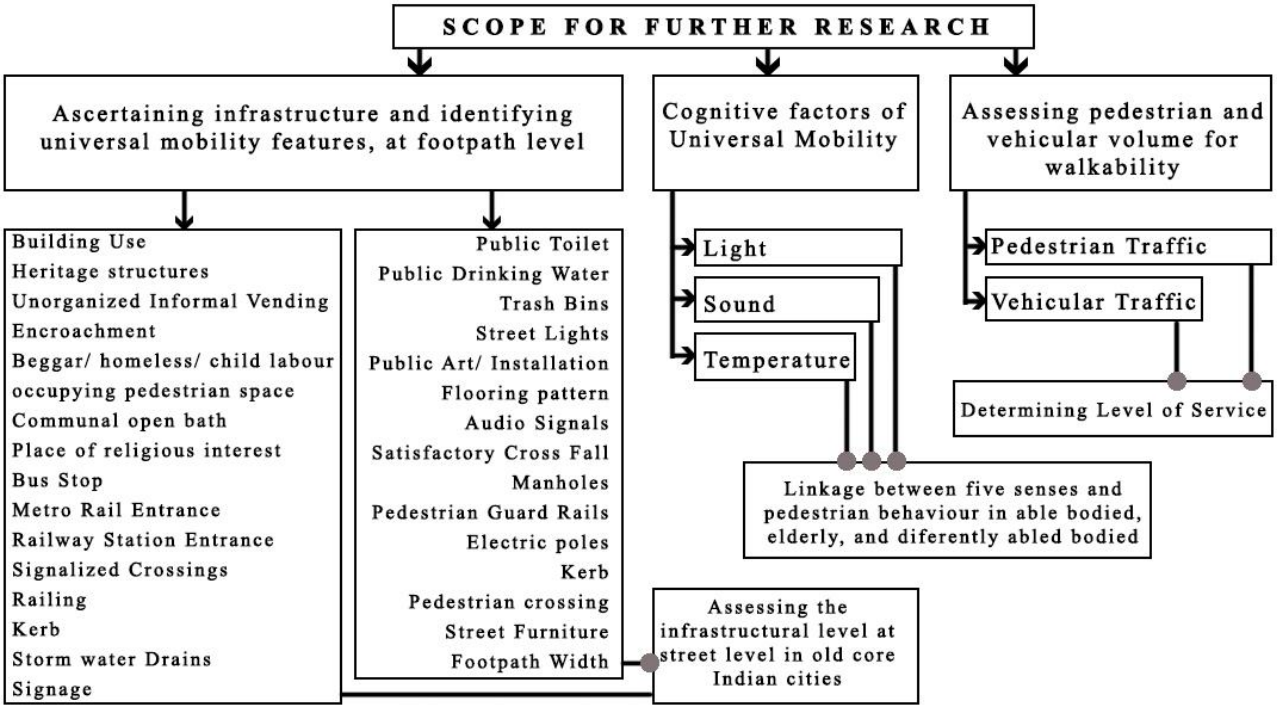

Figure 31. Methodology showing scope of further research based on the learning from this paper. (Source: Author)

Thus, answer research question for this paper, i.e. 'to find out whether core areas of urban India can be made inclusive in terms of accessibility?' is 'yes'. Inclusivity can prevail in old core of Indian cities provided a methodical approach towards universal mobility is practiced, as elaborated in this paper.

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Appendix B: Endnotes

[1]It states "The State shall, within the limits of its economic capacity and development, make effective provision for securing the right to work, to education and to public assistance in cases of unemployment, old age, sickness and disablement, and in other cases of undeserved want".

[2]This act enlisted seven conditions of disabilities; namely: blindness, low vision, leprosy cured, hearing impairment, locomotive disability, mental retardation, and mental illness.

[3]UN-CRPD and its Optional Protocol (A/RES/61/106) were adopted on 13 December 2006 at the United Nations Headquarters in New York, with an aim towards changing attitudes and approaches to persons with disabilities.

[4]17 goals are included in UN-SDG (2015). They are adopted by all member nations. The goals aim towards a safe, sustainable and prosperous world. [Weblink: https://sdgs.un.org/goals]

[5] According to data from World Population Prospects: the 2019 Revision, by 2050, one in six people in the world will be over age 65 (16%), up from one in 11 in 2019 (9%). The main factors behind this phenomenon are declining fertility, increasing longevity, and international migration.

[6] It is a practice which provides exclusive facilities to the people with disabilities and elderly people; both at building and urban level.

[7]In India, only those places will be considered urban which has: (a) minimum population of 5000, (b) density of 400 persons per square kilometre, and (c) 75% of working population engaged in non-agricultural occupation. Urban areas are further classified into Census towns, Statutory towns and Outgrowths.

[8]There were 82 signatories to the UN-CRPD, 44 signatories to the Optional Protocol, and 1 ratification of the Convention.

[9]In Indian subcontinent old cities can have multiple definitions. For this research, cities evolved during early 18th Century (start of British Era) are considered as old.

[10]As on 2011, India's population is over 1210 million with a decadal growth rate of over 17%.

[11]As on 2011, India's density increased from 325 person/ sq.km in 2001 to 382 people/ sq.km in 2011 (with over 17.5% increase). The population density in person/ sq.km is: 292 for rural, 1241 for outgrowth, 2069 for census town, and 3977 for statutory town. The core areas in the city are further denser. In case of Kolkata Municipal Corporation, the density is over 24,200 person per sq. km. against national figure of just 382 person per sq. km.

[12]It refers to the provisions for people from able-bodied and differently-abled to access the urban facilities without discrimination.

[13]India got independence on 15th August, 1947 from British.

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[14]The first planned city in India post-independence. Designed by Le Corbusier, it is the capital city of two states in northern India - Punjab and Haryana. It is characterised by the principles of CIAM (Congress Internationaux d' Architecture Moderne) Theories defining four major city-functions i.e. Living, Working, Care of Body & Spirit, and Circulation.

[15]It is the capital city of Odisha, an eastern state in India. It was planned by Otto H. Koeningsberger. In spite of being a historic town, modern Bhubaneswar was based on balanced open space, planned transportation corridors and built up areas.

[16]In India the age of 60 is the official age for becoming senior citizen

[17]It is the capital city of West Bengal, an eastern state in India which shares international border with Bangladesh, Nepal and Bhutan. Till 1911, it was the capital of British India. Many core areas in Kolkata are congested and having significant lack of basic urban infrastructure.

[18]The capital of India and has a Mughal origin and British intervention

[19]Delhi Metro (a type of MRTS) was operationalized since 2002 and is the second metro rail network in India after Kolkata (1984). Delhi Metro serves is a premier example of universal mobility in transportation owing to presence of elements tactile paths, auditory signage, ramps and elevators.

[20]Launched on 3rd December, 2015 (International Day of Persons with Disabilities) by MSJE, Government of India

[21] An audit format to check the condition of accessibility based on parameters (like presence of ramp) and indicators (like slope or material of the ramp).

[22]Architect Ronald Mace (1941-1998) was affected by polio from the age of nine and was wheelchair bound. He was the President of Barrier Free Inc. and had worked on First Accessibility Code of USA. He founded the Centre for Accessible Housing (now known as Centre for Universal Design). He received service award from President In 1998, he died due to heart arrhythmia caused due to polio.

[23]W.H.O. started in 1948 and now works with 194 member nations, having 150 country offices. Its primary work areas are- health systems, health through the life-course, non-communicable and communicable diseases, preparedness, surveillance and response, and corporate services.

[24]It focusses on disabled friendly provisions in products and designed space.

[25]It refers to the tendency of people to return to normal state after the occurrence of an extreme event (good or bad).In this case, exclusive facilities for the elderly might be less utilitarian than universal design.

[26]Older people may report higher state of satisfaction due to the lower expectation. In this case providing exclusive facilities for them might seem inappropriate.

[27]Developed by Goldsmith (2000), this unique pyramid model serves as a benchmark to understand the user interface in Universal Design.

[28]The guidelines in India in this regard: (a)1987: IS 4963 - Recommendations for Buildings and Facilities for the Physically Handicapped, (b) 1998: Guide lines and space Standards for barrier free built environment for disabled and elderly persons (CPWD), (c) 2005: National Building Code- Annexure-D, CPWD Guidelines, Guideline of Barrier Free Environment, and (d) 2012: Guidelines for Pedestrian Facilities (IRC-103).

[29]A design pedagogy in which the user interface is imparted topmost priority amongst the three components of design: context, content, and user.

[30]Architectural Planning, as described by Prof. Dr. Suguru Mori from Hokkaido University is a discipline for planning architecture. It helps in conducting "practical problem interest (research approaching reality)" rather than "research problem interest (research for research)".

[31]Ronald Mace coined the term Universal Design that year

[32]It started as a welfare community movement in in order to improve the physical environment of Machida City, near Tokyo in Japan

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[33]It is an abbreviation for the Law for Promoting Easily Accessible Public Transportation Infrastructure for the Aged and Disabled. Enacted in 2000, this law specifies smooth mobility standards. Besides it includes barrier free accessibility plan for terminals, rolling stock, railway stations and surrounding areas.

[34]It was a project to develop the welfare/ utilitarian model cities for the disabled; particularly focussing on the improvement of living environment with population of 0.2 million or more.

[35]It was developed by eminent researchers from India in the field of Universal Design and Accessibility, including Prof. Dr. Rachna Khare, Prof. Dr. Abir Mullick and Prof. Gaurav Raheja.

[36]According to 'The Habitat III Policy Units and Papers' coordinated by the Habitat III Secretariat, 'City for All' The right to the city encompasses all civil, political, economic, social, cultural, and environmental rights as enshrined in existing international human rights treaties, covenants, and conventions.

[37] The meetings too place through ZOOM and GOOGLE MEET platforms

[38]Google form link for understanding 'Opinion of Design Fraternity in India': https://forms.gle/Cx5v4VNsiTV8LQQ28

[39]It refers to questions having two answers, for e.g. Yes or No, True or False, or Agree or Disagree.

[40]It refers to recording response on the basis of rating scale.

[41]They are rating systems which defines the degree of sustainability in a built environment. Various bodies specify green ratings, like LEED (United States), GRIHA (India), and CASBEE (Japan). Depending on the degree of sustainability, IGBC classifies projects into Silver, Gold and Platinum ratings.

[42]It is eco-sensitive way of designing and refers to design that creates healthy living environments while aiming to minimise negative environmental impacts, energy consumption, and use of human resources.

[43] India was a British Colony since 1947

[44]Due to coronavirus pandemic, India experienced a nationwide lockdown (complete and partial) from 22nd March 2020 till 30th November 2020; this meant restrictive movement for the authors and resulted in online interview.

[45]The questionnaire can be accessed digitally from the following link: https://forms.gle/oB9MvhWSfQ6PZAKk9

[46]Smallest administrative unit in Indian Urban administrative system

[47]It is the municipal authority for the city of Kolkata which covers an area of 206.08 sq. km. with population over 4.5 million and density of over 24,200 person per sq. km. Its history dates back to 1726, during its formation by a royal charter from British Government. Presently, it has jurisdiction of 144 wards. The web link: https://www.kmcgov.in/KMCPortal/jsp/KMCPortalHome1.jsp

[48]Ms. Disha Maity [E-mail: dishamaiti@gmail.com]

[49]Mrs. Manorama Mahanty [Contact: +91-6297943706]

[50]Bengali is the local language of Kolkata and one of the ____ ?official languages of the state (West Bengal) and country (India).

[51] It is one of the six laboratories of the Division of Architectural and Structural Design in Graduate School of Engineering, Hokkaido University. Headed by Prof. Dr. Suguru Mori and Asso. Prof. Dr. Rie Nomura, this laboratory is exploring next-generation planning theory that contributes to improving the quality of life and well-being in a broad sense by working internationally and internationally. [Weblink: http://www.hokudaiapr.com/Home.html]

[52]Also known as PH/ disability/ handicap certificate, this certificate is issue by competent medical authority specifying the type and extent/severity of the cardholder's identity. As on 2021, it is being replaced by UDID (Unique Disability Identity) with a view of creating a National Database for persons with disabilities.

[53]The Google map link for the stretch: https://goo.gl/maps/ph8wWJWiCzY1TgEH8

[54]It is a type of development plan which provides knowledge about the future course of a city/region's growth and development.

[55]Mixed land use refers to co-existence of more than one land use on a single stretch; for example: residential and industrial buildings in a single street. Mixed Use also refers to presence of multiple 'single buildings with different building use on different floors'.

[56]The junctions are: Nirmal Chandra Dey Street, New Bowbazar lane, Kenderdine Lane, Central Avenue (GATE 4_Yogayog Bhawan), Central Metro(GATE 1_Indian Airlines), Bow Street, Metcalfe Street, Bentick Street, Rabindra Sarani Rd., Chatawalla Gully, Phears Bye Lane, Phears

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Lane, Giri Babu lane, Central Metro (GATE 2_Lalbazar), Central Avenue (GATE 3_RITES), Gangadhar Babu lane, Bibi Rozio Lane, College Street

[57]Different scale refers to the junction-typology based on the: (a) width of the streets converging in the junction, (b) height of the buildings along the streets, and (c) predominant type of activities

[58] *'Swachh Survekshan'* is an annual survey of cleanliness, hygiene and sanitation in urban and rural India and was launched as part of the Swachh Bharat Abhiyan (Clean India Campaign, 2016) focussing on making the nation clean and free of open defecation. The first author of this paper was part of the PIU (Project Implementation Unit) which was in-charge of cleanliness audit for Kakinada Municipal Corporation, Andhra Pradesh, India during *'Swachh Survekshan'* 2018.

[59]State-ruling electoral party in Kolkata (West Bengal) as of January 2021 is Trinamool Congress with, Smt. Mamata Banerjee as the state's Chief Minister.

[60]Central-level ruling party in India as of January 2021 is Bharatiya Janata Party (BJP), with Shri. Narendra Modi as the country's Prime Minister

[61] It is a leading research and teaching institute based in Tokyo, Japan with a mission is to advance efforts towards a more sustainable future, through policy-oriented research and capacity development focused on sustainability and its social, economic and environmental dimensions.

[62]Established in 1976, it was developed as a link between research and practice on issues related to urbanization in India. It suggests ways and mechanisms to address different urban challenges in the country.

[63]Established in 1926, it is an Indian institution for urban governance, education, research and capacity building. It works with ULBs (Urban Local Bodies) across India, South Asian and African nations.

[64]Its focus areas are International funding oppurtunities and UK-funded development projects around the world. DFID (2017) merged with Foreign and Commonwealth office in 2020 and became FCDO.