DELHI - ON - DEMAND

TECHNOLOGY

STRATEGY

DESIGN

POLICY

WALKING 5KM

DELHI - ON - DEMAND

TANYA CHANDRA
I choose this studio to test the challenges of balanced urban transformations in an emerging economy.

RESEARCH QUESTION: How to reduce socio-spatial segregation created by 'image building' planning and growing car culture in the National capital region of Delhi by improving the mobility of people within the city?
Poetic gesture towards isms,
is an unpoetic dialogue,
Between man and thought,
constrained by convenience,
as historically plot.

Some had, carried the charge,
others were trailing in the road,
Now behind a green mile,
Is a mark dividing,
anything under the sun,
and an imaginative overrun!

- author
September, 2014

SUMMARY

City-on-Demand is a technology, it gathers the demand of commuter (public transport or walking) and urban residents (public spaces) and interprets the spatial requirement and changes the city’s infrastructure accordingly. Thus creating a real-time dynamic system of demand and supply. Making a city smarter by having a demand based supply chain management of its resources.

It stems from my research on Delhi, where resource (supply) and demand are mismatched and there is an explosion of image based planning resulting in a gentrified and inaccessible city; plagued by pollution, congestion, high car ownership growth, safety and lack of urban commons for its growing density.
This year has been challenging as well as fun, for both I would like to thank my mentors: Marta Relats, Dominic Stead & Akkieles van Nes. Marta’s philosophical and architecture background balanced me between my thoughts and their execution. Dominic’s experience honed my research into questions and questions into a utopia. Akkieles’s spirit and specialisation helped me further into finding my own niche in Urbanism. I found an exponential growth in my approach to the project under their guidance. I also thank my external examiner Henri van Bennekorn for making my presentations’ journey transition smoothly and bringing a new perspective for my project.

Sangita, Dhiraj, Shikhar, Richa, Rawat, Radhe, Shami, Puran, Suraj and Savitri are the people who through their experiences with the city of Delhi brought life to my project. Their daily lives grounds my project in reality and how & what should be done to make their city experience more enjoyable; at the same time making the city accessible by people from all walks of life residing in Delhi. Their inputs helped me grit my project into finer details. I would also like to especially thank Sangita (my mother) for helping me collect data and take interviews back home when I felt immobile in Netherlands.

The project couldn’t have sparked ahead without the research from researchers that I have referred too. My project wouldn’t be at this stage without the many inspiring studies that I have read and come across.

The last thank you but not the least is to my family and friends for bearing up with my eccentric disposition throughout the last year. As support is what can help project one forward!
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“To put it paradoxically, there is today so much communication, means of communication, and communication theory, that there isn’t any community. So much socialism, social-agency, and sociology that there isn’t any society of work and living.” - Goodman & Goodman, 1947, p104

As a kid, I remember watching a cartoon about people from the future travelling back in time, what fascinated me about it even now is them celebrating the ‘Word Unification day’. Though this dream is light years away from reality but holds the crux to my idea of an ideal community - Working together, travelling far & wide and being tolerant while understanding each other.

As an student of urbanism from India, I have grown up seeing cities with bi-polar disorder, transcending from social, cultural and economic factors and translating into spatial qualities of the city. This bi-polar nature of Indian cities is spatially derived from the inversely proportional system of distribution. While the nation is running behind the global capital model of ‘competitive economy’, the human capital is competitively deteriorating. This is for me is Dystrophic Utopia.

In ‘Wealth of Cities’, John Friedmann put a city’s true wealth in its human asset - people and the quality of their lives and livelihood. For a human the basic needs are shelter which he can call his and mobility through which he can fend for himself. Thus, an ideal community for me is where urban equity exists especially when it comes to housing and mobility. A community that provides the covers at night and mode of resource in the daily life. An understanding of this multi-nodal network which helps them to work, live and grow together.

As,

“A city is said to be an assembly of people, a congregation drawn together to the end they may thereby the better live at their ease in wealth and plenty. And the greatness of a city is said to be, not the largeness of the site or the circuit of the walls, but the multitude of the inhabitants and their power.” - Kostof, 1999, Introduction
AIM OF THE PROJECT

"What is the solution, when solution is the problem?" (Pritchett & Woolcock, 2004). Delhi is going through massive urban upgradation in terms of infrastructure and development for its attainment of "world-city" title. Promoting high technological solutions for public transport, encouraging suburban gated communities served by cars and resettlement of urban poor at the periphery of the city, which form 55 percent of the population and depends extensively on non-motorized modes of transport.

This urban re-configuration for 'progress' creates a socio-economic segregation and making Delhi a bi-polar city. A city which gives priority to motorized based development and causes a peripheral push to those who cannot afford this type of urban development.

Thus, Mobility is a tool for urban development and land-use pattern, therefore, it is also primary symptom of urban decay. Therefore, the project aims to study the causes and symptoms of Delhi's socio-spatial deterioration due to segregation between different economic groups through their options of mobility.

Mobility being part of everyone's urban life and need. It is also a key for social-interaction, accessibility to the city & its amenities and key to urban development and land-use. By making mobility for people equitable, one can achieve social and urban equity.

Maslow's Pyramid & income group division of the Indian population within it; source author, 2015

PERSONAL RELEVANCE

"If you plan cities for cars and traffic, you get cars and traffic. If you plan for people and places, you get people and places."

- Streets are People Places, Fred Kent, 2005

India is my home, I have lived, work and travelled almost all corners of it. Not even one corner even in its magnificences does not paint a picture of social inclusion. As am emerging economy to me it seems, people are just running behind what is shiner. But, unfortunately in their run they forget to see who they are trampling. And cities have become best example of this pit of social decay.

As a student of urbanism this is what I chosen to study and hopefully cure this urban decay. And as ground is where everyone is equal, mobility seems to be the key to start with.

ETHICAL SUBSTANTIATION

As the Maslow's pyramid states that without the basic needs you cannot move forward. Thus, with 60% of the population struggling to enter the base of the pyramid, Delhi, India cannot make a true progress.

The aim of any economy is progress and its directly effects the urban life, development and distribution. Thus, ethically to start with a profession of Urbanism it is important to understand the urban question of progress and its needs.
The Great Indian Story
BY AECOM:

Being able to learn from the landscape, respect traditions, cultures and heritage are fundamental, as well as working collaboratively towards the common goal to ensure future generations are able to enjoy and celebrate the uniqueness of India.

Indian cities are broadly characterized as having high densities, intensely mixed land-use patterns, short trip distances and high share of walking and non-motorized transport (Tiwari, 2002). Although, systematic failure in Delhi is evident by the current state of city. As per the first Delhi Master Plan in 1962 laid a green belt around the city which has been exploited by gated communities by private developers.

Income group co-dependency:
“Often a job in the formal sector requires services provided by the informal sector: each high income household is dependent on 5-6 lower income household” (Tiwari, 2003, p446). Thus, the extensive mixed land-use based on transport pattern and porous labour market of Delhi (Thakuriah, 2009) generates issues to job accessibility for lower income groups who are pushed on the periphery of the city creating long distance commute.

Newton’s third law of motions defines mobility and function of a city. As a change in one leads to a ripple effects in another. Urban land-use transport models incorporate the most essential processes of spatial development in a city (Wegener, 2004). The urban fabric contains land-use patterns and infrastructure network which evolve slowly with time. Where on one hand workplaces and housing follow a similar pace of change but on another hand employment and residential population adapt their spatial behaviour with the changing times far rapidly. This process in Delhi is interpreted through one criteria - economics.

“Capitalist development must negotiate a knife-edge path between preserving the values of past commitments made at a particular place and time, or devaluing them to open up fresh room for accumulation.” (Harvey, 1985, p150). But, as Reiner de Graaf points out in the “The smart city is not so smart”, Design Middle East that contemporary urban planning operates on artificial ‘tabula rasa’, where this race to modernise usually overlooks that is closest. Thus using the fresh room option of capitalism as place making.

In Delhi the social construction is not a private taste or preference but a political project of class formation (Fernandes, 2004). And urban projects are undertaken as ‘concentration on spectacle and image rather than on the substance of economic and social problems’ (Harvey, 1989: 16). Transport being the under belly of this machine of ‘urban spectacle’ (Gotham, 2002). Where high technological solutions for transport in a developing countries are hardly appropriate to the needs of the majority of urban residents (Choguill, 1993). Thus restructuring of the urban space using ‘politics of forgetting’ of marginalized social groups is leading to polarization of the city (Dupont, 2011; Fernandes, 2004).

The project studies how through history, the city’s imageability became important to showcase its progress and led to the current state of social-segregation. While pointing out that, how image building is being done through transport using it as a tool and how it is further contributing to socio-economic burden for the urban poor. Thereby leading to the urban consequences of this way of planning which is fragmented urban fabric and unsustainable urban growth.

Economic policies support increase in car and 2-wheeler productions and further making easy credit availability for purchase, subsidization of petrol and diesel prices, availability of parking and entering throughout the city. Further policies that fuel this phenomenon are construction of expensive public transportation, lack of policies to price personal auto travel and as discussed through the paper the spatial mismatch between job and residential location (Thakuriah, 2009).

India is a subsidize state, it ruins being the economically failing urban transport system which are too expensive to masses of lower income group but easily affordable to middle income group. Leading to socio-spatial segregation and urban decay.

Architecture and Urbanism have for a long time been dependent on the nation state. We cannot imagine doing without a strong government and huge public investments for developing housing projects and public buildings, or for designing huge and even utopian visions for new cities and regions. Architecture and planning are starting to lose their traditional role and authority to represent the nation.

But is this a bad thing? Can we imagine a world without the state? Can we imagine architecture and planning without public authority? Can we imagine a purely community based design? Now that we see the structures and certainties of the twentieth century crumbling around us, the new ideas are coming from small, autonomous even anarchistic communities and initiatives. Here we find the imagination of new societies: on the ruins of the welfare state” - DaP Website, 2014

Studio Description:
“We are living in an age where nation states seem to become weaker and weaker, under the influence of privatisation, localism but also of globalisation and supra-national politics like that of the European Union. Countries seem to be both falling apart in small fragments as well as being dissolved into huge global networks.

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The project is named face to face as it is about socio-spatial segregation in Delhi, which due to its planning has created a bi-polar city. 35% of the city that walks but planning is done for car and expensive public transport not affordable by 55% of its population.

Walkability is aimed as a trigger for urban change. My utopia has just one clause, everyone walks to live, work and play. Thereby, understanding the co-dependency of each income group on another and bringing them closer to live, play and work together. With the absence of motorized traffic, the project aims to shed away the bubbled life that one lives in a car and gated community. Thereby, re-configuring the land-use and making the open network of transport as not only a place of mobility but social-interaction between different groups. Hence, reconfiguring the city into smaller district of compact living and facing & understanding each other.

As walking is the only mode that doesn’t need an economic backing as a choice of transit mode, thus it becomes a pioneer in bringing all income to ground reality of urban life - a safe and diverse environment.

Place that contribute as a whole to social, economic and environmental benefits have (Britain, 1999):
- compact form
- diversity
- connectivity
- ecological awareness
- good governance
- social inclusion
- good design
- walking

On ground everyone is equal!

The topic of this year studio is ‘New Utopias on the Ruins of the Welfare State’. The ruins are the bi-polar city created by continuous subsidies provided to middle and higher income group which encourage car travel, unaffordable public transport and thereby gated communities. Through my Utopia I challenge the notion of that motorized traffic is the only way to serve the city’s growing needs and bring to light the 35% of the population that walks for whom there are no provisions provided in the network. Creating a new society where understanding the co-dependency is the key to living. I use my Utopia as a guiding goal (Immanuel Kant) for my project.

RIPPLE EFFECT OF MAKING A WALKING ONLY CITY.

WALKABILITY: A TOOL FOR LAND-USE RECONFIGURATION

EXISTING

WALKABILITY: A TOOL FOR LAND-USE RECONFIGURATION

RESIDENTIAL SPHERE & CENTRES

WALKABILITY SPHERE

MIXED INCOME HOUSING & AMENITIES DISTRIBUTION

MIXED INCOME HOUSING & AMENITIES MODULE

DISTRICT

DENSITY

NETWORK: PEOPLE AND GOODS

PROJECT Scope

SPATIAL

IDEOLOGICAL

SOCIAL

POLITICAL

ECONOMIC

URBAN EFFECTS

PHASE I

PHASE II

PHASE III

PHASE IV

UTOPIA : WALK DELHI | CHALO DILLI - 22 millions people
As an emerging market, Indian cities are faced with rapid urban changes for ‘progress’. We are exchanging human scale with technology that reduce one in a bubbled life of gated communities and private motorized transport. Delhi as the capital faces this image planning since 1980s.

The repercussions of image planning in Delhi has led to the growing car culture and with the focus of governmental developmental on high technological public transport (Metro rail), both of which are unaffordable by the 55% of lower income group helpless.

This problem is accentuated further when the urban poor is driven to periphery of the city, where affordable transport is lacking and non-motorized transport is limited by its range. Leading to poor quality of life for the urban poor due to limited job accessibility, strenuous commuting hours, poor provision for pedestrian and cyclist, unavailable public transport, lack of accessibility to social amenities and poor job security due to lack of job choices.

Due to socio-spatial segregation, there is creation of socio-economic burden on the urban poor which is reflected clearly through their options of transit mode. Though the make the majority in number but or the most public space, the roads, they make a minority in priority.
source: LSE cities, urban age conference 2007
CONTEXT - LITERATURE REVIEW

CATALYST TO THE PROBLEM GROWTH

Background

Image-ability was brought in as a tool for urban planning in Delhi after the revolt of 1857. Its base was the historical Mughal centre 'Shejahanabad' within Delhi, the labyrinth street network being unfamiliar to European eyes made it difficult to curb the revolt. As a result, post mutiny the settlement was damned as potential danger, detention and of disease. Leading to European ideas of city order and planning to ameliorate the poor condition of the city and how city's residents lived (Batra & Mehra, 2008). Thus, Lutyen's axial Delhi was made as an extension of 'modern' Delhi, on the same pretext as Haussmann's Paris.

Post-Independence

Indian cities have a highly centralised planning process, leaving a little space for elected representative and bureaucrats of the city government to play a part. Thereby, reducing democratic processes at municipality level and reducing chances of modification of plans (Ghertner, 2011). This coupled with place-making and urban ‘boosterism’ (Harvey, 1989) we get urban projects that revolve around being modern, 'modern' being 'non-traditional' (Hosagrahar, 2005).

In 1957 Delhi development authority (DDA) was established. But as Gyan Pandey (2002) criticises that the urban question was absent at the time of independence, with Gandhi striving for self-reliant villages and Nehru of a modern India (Batra, 2009). Thus, DDA's was primarily a tool for acquisition, development and disposal of massive tracts of agricultural lands (Batra & Mehra, 2008), with the first master plan of Delhi being published in 1962. The urban land policy of 1961 premised DDA to control land within the urbanisable limits of Delhi, outside the national capital territory (NCT). Leading to new gated neighbourhoods in satellite cities (Gurgaon and NOIDA) projected as genuine urban entities but developed by private property developers (Dupont, 2011; Ghertner, 2010; Gugler, 2004).

In 1980s the Indian government recognized its cities as a major contributor to the GDP (Gross Domestic Product) and with economic liberalization came the deep rooted ambition to develop large metropolises into global cities. This lead to series of economic and administrative reforms in 1985 (Dupont, 2011).

Economic Liberalisation

Delhi in the wake of economic liberalization in 1991 saw a major restructuring of its urban space resulting in aggravation of socio-spatial inequalities (Dupont, 2011). Delhi being the capital city comes under special attention and used as an example by the government. This was followed by generation of a 'new' Indian middle class, characterized with consumerism, leading to re-structuring of urban spaces as the demand for real estate and motorized modes increased. In 1992 the urban sector was inflicted with strategies promoting decentralization, deregulation and privatization (PPP models), such that Indian cities can be part of the network of larger global economy. In 1999 urban land ceiling & regulation act was repealed leading to land speculation and pushing the growth outside NCT of Delhi into the satellite cities.
This social restructuring led to growth in second tier cities like Gurgaon and NOIDA constructed and marketed by private developers (Dupont, 2005) and having limited public transport. “The implications of the drive for global status for Delhi’s socio-spatial restructuring further confirm the critique of Robinson (2002; 2006) and Lemens (2007) regarding the problematic implementation of a Western construct – the global-city model – in countries of the South with limited resources.” (Dupont, 2011).

Social-segregation through urban development policies


‘Green Delhi, Clean Delhi’ movement helped legalize status to slum demolition requests by Residential welfare society (for middle income groups) under Bhagidari scheme at Delhi high court. Bhagidari scheme helped ‘legal’ citizens and government partnership programmes, it gave decision making tool only to middle and higher income groups leaving the socially marginalized group settlements (slums) to be pushed 10-25km away from their original location. Further justified with J NURTM (Jawaharlal Nehru New Urban Renewal Mission) scheme in 2005, which provided slum resettlements and public transport. But these scheme fail to realize the consequences to 10-25km resettlement shifts and job accessibility. The public transport scheme were plagued by only providing to NCT and not the satellite towns, whereas resettlement colonies are relocated at the border of NCT. Whereas, Metro which aims to serve the larger national capital region is limited due to its affordability, but currently on the main agenda for public transport development. Creating a vicious cycle of displacing lower income group from the inner city further and providing public transport which is economically unavailable to them.

Transport is the Key

Urban transport is a key to Delhi’s spatial expansion and economic viability as aimed for in the Master Plan for Delhi 2021: “Vistaion-2021 is to make Delhi a global metropolis and a world-class city” (DDA, 2007: Introduction). Mega infrastructure projects are taken to ease vehicular traffic by constructing 28 flyovers, (2007-10), bridge over Yamuna, metro (first line opened in December 2002), high capacity bus system with dedicated corridors (later revoked due to protest by car owners) and modernization of Delhi airport in 2006. This “overdue modernization” was considered “an essential step towards improving connectivity within India and with the rest of the world” (Yinayak and Ghosh, 2006: 22) and also observed in other aspiring global cities (Gugler, 2004). Whereas, it does not account for the marginalized social groups which make 55% of Delhi’s population for whom bus is economical limit (Fernandes, 2004).

The mega projects of transportation play like the two sides of a coin, they are promoted as transport need for the city by planners and another side are criticized by transport experts for being capital intensive project yet badly responding towards ridership, reduction of pollution and lack of financial sustainability (Modan, 2008). They are rather used as a hidden agenda to portray as a symbol of progress (Siemiatycki, 2006). Transport planning in Delhi thus shown to be “a vehicle for societal transformation” but instead planned to be “the triumph of image over substance” (Harvey, 1989: 13).”
There is an increasing socio-spatial segregation in Delhi, with economically marginalized groups hanging on the edge of the city with minuscule support to access the city and thus increasing the burden on them. But, it is important to note that each income group is co-dependent. In a competitive economy, most times lower income groups are sacrificed in the name of ‘progress’. This can be clearly seen in the transport planning of Delhi. Where high-technology public transport and car planning are given emphasis as development goals by the city whereas 55% of the city’s population cannot afford them.

Leading to areas developed around these transport network being occupied by higher income group and lower income group being removed (slum demolition) and resettled in areas that do not have a strong transport link or not affordable by them.

Thus, to achieve social equity and thereby economical vitality, the challenge lies in a balanced urban transformation which is led by a sustainable and public - mobility network for people, As, transport is a tool for urban change and dictates where the city is going.

“Important quality a city can have is not actually visual. It is: SYNERGY! – a multiplier that can transform a human settlement into much more than the sum of its parts. This is a concept of crucial importance to the developing World. For across our planet, rural migrants are pouring into towns and cities. It is one of the biggest watersheds in the history of mankind – perhaps since nomadic Man built his first homestead. And however much housing we construct for these desperate migrants, we must never forget they are coming to the city not for housing, but for jobs.”

- Charles Correa, Great city...Terrible Place, 2015

Vehicular ownership percentage; Source: Tiwari, 2003; economic survey 2007-08, Delhi planning department.
Urban changes in developing countries are marred with rapid motorization, rising incomes, urban sprawl, undeveloped road systems and spatial mismatches with time losses estimated from traffic jams to compromise 2% of GDP in Europe and 2-5% in Asia (Cervero, 2013).

Cervero lists the contrasting features of urban form context between a developed and developing countries. Firstly, developing countries have more primacy and therefore are mono-centric with few cities containing large shares of inhabitants. As in India only 100 of the 5,000 cities have formal public transport (Jain, 2011). Secondly, developing countries’ cities are considered twice as dense as European and five times when compared to a city in United States and Australia, but rapid decentralization is leading to further choked urban transport arteries and putting a burden on the limited resource to expand affordable public transport to all. Thirdly, sparse road densities and poor road hierarchies seem to fuel the problem further; Delhi for example has devoted 21% of its land area to roads alone, whereas Mumbai has 11% and Kolkata 5%, the other two metropolitans in India. Lastly, Social geographies of a developing country is quite different from a developed country, where spatial mismatches underline housing of poor and needy to where formal jobs with liveable wages are stretched across the city. Indian cities are broadly characterized as having high densities, intensely mixed land-use patterns, short trip distances and high share of walking and non-motorized transport (Tiwari, 2003). Although, systematic failure in Delhi is evident by the current state of city. As per the first Delhi Master Plan in 1962 laid a green belt around the city which has been exploited by gated communities by private developers. But, the resettlement colonies and industrial areas which were to act as ring around the city have been redundant to suburbs. Roads leading to satellite cities are dotted around with urban sprawl and are the most congested in the region (Tiwari, 2003).

Comprehension of transport and land-use patterns in the city is made difficult due to complexity increase by mass poverty and non-motorised transport whereas planning are looked with a glass eye of motorised planning methods. This spatial mismatch is leading to growing urban issues especially in terms of transportation planning. This results in environmental decay, congestion and poor health conditions.

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<th>Regions defined in the model</th>
<th>New urban land area with probability greater than zero (km²) by probability quartile range (regional percentage)</th>
<th>2006 urban extent (km²) (regional percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt;2.5</td>
<td>&gt;2.5-50</td>
</tr>
<tr>
<td>Central America</td>
<td>22,660.00 (0.8)</td>
<td>6,590.00 (0.2)</td>
</tr>
<tr>
<td>China</td>
<td>1,349,650.00 (4.3)</td>
<td>38,800.00 (0.4)</td>
</tr>
<tr>
<td>Eastern Asia</td>
<td>10,825.00 (0.7)</td>
<td>5,675.00 (0.9)</td>
</tr>
<tr>
<td>Eastern South Asia</td>
<td>12,850.00 (0.1)</td>
<td>3,750.00 (0.0)</td>
</tr>
<tr>
<td>India</td>
<td>546,000.00 (1.7)</td>
<td>16,690.00 (0.2)</td>
</tr>
<tr>
<td>Mid Asia</td>
<td>5,950.00 (0.2)</td>
<td>2,025.00 (0.1)</td>
</tr>
<tr>
<td>Mid-Latitude Africa</td>
<td>531,615.00 (2.6)</td>
<td>31,025.00 (0.2)</td>
</tr>
<tr>
<td>Northern Africa</td>
<td>36,000.00 (0.4)</td>
<td>6,490.00 (0.1)</td>
</tr>
<tr>
<td>Northern South America</td>
<td>171,775.00 (2.0)</td>
<td>21,095.00 (0.1)</td>
</tr>
<tr>
<td>Oceania</td>
<td>5,300.00 (0.1)</td>
<td>1,675.00 (0.0)</td>
</tr>
<tr>
<td>South America</td>
<td>264,175.00 (1.5)</td>
<td>33,600.00 (0.2)</td>
</tr>
<tr>
<td>Southern Africa</td>
<td>10,950.00 (0.4)</td>
<td>2,575.00 (0.1)</td>
</tr>
<tr>
<td>Southern Asia</td>
<td>70,900.00 (2.1)</td>
<td>16,725.00 (0.3)</td>
</tr>
<tr>
<td>Southeastern Africa</td>
<td>58,400.00 (1.3)</td>
<td>7,775.00 (0.2)</td>
</tr>
<tr>
<td>Western Asia</td>
<td>966,875.00 (2.1)</td>
<td>45,975.00 (0.1)</td>
</tr>
<tr>
<td>Western Europe</td>
<td>141,400.00 (1.8)</td>
<td>13,075.00 (0.3)</td>
</tr>
<tr>
<td>World</td>
<td>4,202,75.00 (3.2)</td>
<td>250,300.00 (0.2)</td>
</tr>
</tbody>
</table>
Employment in industry grew in 1951-17%, 1981-29%, 1991-33% whereas, between 1961-71 industries employed less than 10 workers by 444% in Delhi compared to 51% in Mumbai (Tiwari, 2003). "Often a job in the formal sector requires services provided by the informal sector; each high income household is dependent on 5-6 lower income household" (Tiwari, 2003, p446). Thus, the extensive mixed land-use based on transport pattern and porous labour market of Delhi (Thakuriah, 2009) generates issues to job accessibility for lower income groups who are pushed on the periphery of the city creating long distance commute.

Contradictory to the numbers, following transport policies were adopted after the release of White paper on Delhi pollution in 1997. Construction of express-ways, grade separated intersections, one-way streets, metro construction, phasing of old buses and bus fleet to run on natural gas. And as Chegulli, 1993 noted that usually High technologies urban development in developing countries does not serve entire urban residents. Thus, there are no changes in walking percentage instead middle income have moved to metro reducing bus usage and importance, which is vital in poor households.

Transport Policy Adopted

<table>
<thead>
<tr>
<th>Mode</th>
<th>Low-income population</th>
<th>High-income population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle</td>
<td>39.24</td>
<td>2.75</td>
</tr>
<tr>
<td>Bus</td>
<td>13.53</td>
<td>26.53</td>
</tr>
<tr>
<td>Car</td>
<td>0</td>
<td>24.37</td>
</tr>
<tr>
<td>Scooter/motorcycle</td>
<td>2.48</td>
<td>29.25</td>
</tr>
<tr>
<td>Three-wheeled scooter taxi</td>
<td>0.96</td>
<td>1.74</td>
</tr>
<tr>
<td>Taxi</td>
<td>0</td>
<td>0.4</td>
</tr>
<tr>
<td>Rail</td>
<td>1.79</td>
<td>0</td>
</tr>
<tr>
<td>Other vehicles</td>
<td>2.34</td>
<td>1.42</td>
</tr>
<tr>
<td>Walking</td>
<td>22.52</td>
<td>0</td>
</tr>
</tbody>
</table>

Estimated shares of transport modes in Delhi, source Tiwari, 2003

Transit mode share when walking is taken into account

Delhi’s transit mode share, source adapted from Tiwari, 2003, Economic survey 2007-08
Reasons of Car Growth

The growing car culture of Delhi is not only a product of status symbol but also a series of policies that support its need and want in a city. Economic policies support increase in car and 2-wheeler production and further making easy credit availability for purchase, subsidization of petrol and diesel prices, availability of parking and entering throughout the city. Further policies that fuel this phenomenon are construction of expensive public transportation, lack of policies to price personal auto travel and as discussed through the paper the spatial mismatch between job and residential location (Thakuriah, 2009).

On transport planning besides it affordability factor, time consuming public transport does not ease the burden. On the other hand mixed traffic or popularly known as shared street in west make walking and bicycling unsafe in Delhi. Hence, increase road fatalities of cyclist and pedestrian (Tiwari, 2003; 2002; Mohan, 2008).

Socio-Economic Burden to urban poor

The various issues related to transport planning in Delhi have adverse effects on the most economically critical groups of the society (Tiwari 2002, 2003; Thakuriah, 2009)

- Low income households spend large portions of their income on transport thereby limiting their economic choices of their other basic needs (food, shelter and health)
- 70% of slum residents in Delhi find commuting to work most dangerous aspect of their work (Hazard centre, 1998)
- Commuting to work for poor households is not a matter of choice but necessity for survival, therefore irrespective of mode facilities available or not they continue accommodate themselves in continuous spatial re-configuration.
- Exposure to high rates of traffic fatalities and pollution intensifies
- Reduction of employment opportunities and dampening effect in wages, due to lack of adequate access to job sites
- Housing in slum dwellings close to temporary or seasonal jobs

Estimates of oil consumption subsidies in US$ billion (2011); source Rode & Floater, 2014

Global diesel (L) and gasoline (R) prices in US$ billion (2012); source Rode & Floater, 2014

Top 10 countries in global automobiles sales (L) and production (R) in 2013; source Rode & Floater, 2014

Number of vehicles worldwide and motorization index by region (2005 and projections to 2035); source Rode & Floater, 2014

Profile of persons killed in road accidents in Delhi; source Agarwal, 2006
How to reduce socio-spatial segregation created by 'image building' planning and growing car culture in the National capital region of Delhi by improving the mobility of people (public transport and walk-ability) within the city?

1. How to establish a dual system of walkable neighbourhoods and public transport city network (especially in socio-spatially segregated neighbourhoods)?

2. How through urban design and policy can one reverse the car culture?

3. How can one convert the current over-built transport network for cars into a sustainable networks of walking & cycling (neighbourhood scale) and mass transport systems (city scale)?

4. How to implement the challenge of a balanced urban transformation in an emerging economy?
The theory was proposed by Walter Christaller, who stated that settlements simply functioned as ‘centre places’ providing service to surrounding areas. The base of the theory is that every function has a threshold and range. The computation of this theory results in models that conclude with larger settlements being fewer in number, larger the settlement have greater distance between them, as a settlement increase in size the range of its functions increases and expansion of a settlement results in greater degree of specialisation in services.

Why is it applicable for the project?
The theory is important for the project, as it highlights the strong connection between function and transport network and that when balance have a direct effect on the size of the settlement. A direct effect at the neighbourhood level while designing a network and what should it connect and which functions should be introduced to serve its inhabitants.

How is theory and project linked?
When the utopian ideology of walkability is applied to this urban model one sees a clear distinction in its network of hierarchy, connecting larger range functions with higher hierarchy connections and smaller range functions with lower and quicker hierarchy connections.
The urban model like garden cities and centre place theory and urban theories of Jane Jacobs are based on the underlying connections between live, work and play. Playing around the distances between these functions and redefining each theory with new parameters to understand the relationship between them for a healthier life.

Whereas, urban critics judge and research these theories on the parameters of economics, environment and quality of life. Each parameter has different importance depending of the outlook of the researcher.

But, magic of urban environment happens when you combine these six parameters together and if they all are in perfect balance, one gets a balanced urban life. But, perfection is difficult to achieve in a competitive economy. Thus, one should consider the six parameters while design any urban design element especially the urban connections which bring them together. Mobility is the tool of urban design and key to its balance.

As perfection of urban life is difficult to achieve, the urban life tends to balance itself in its own absurd accord. When pushed in any criteria of economics, quality of life and environment the urban fabric reacts to get in balance but what would a continuous state of push and pull will result into?

Middle income and economically weaker section of society cope with different push by the parameters in a different way as a way to survive. As can be seen in the adjacent table of diagrams and pictures.

It is important to understand this balance and push and pull when applying a urban model because they define the context of each city and neighbourhood making the design applied to be customized with context of the culture and lifestyle of each place.

Through my project I want to adapt walk-ability in terms what it means to the city of Delhi. Thus, acknowledging hawkers, street vendors and informal economy of a place and neighbourhood and take them into account when designing a pedestrian network as they thrive on them. Also, taking into account that street vendors and hawkers are like service points to pedestrian under the Indian sun as gas station on a highway is to a car. This is one of the many considerations that Indian context brings in.
### Case Studies of Successful Practices in Transport Planning and Design

The case studies of good practices has been done as one of the methodology to understand the issues with implementation, who implements them and how can they be done; with a critical outlook on how they can work in Delhi. Thus, giving an outlook to how the project should be framed and what are other elements are needed to support the design - strategy, phasing plan and policies both spatial and economical to determine the end products of this project.

<table>
<thead>
<tr>
<th>Place</th>
<th>Technology &amp; Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Osaka, Japan</td>
<td>How to use old infrastructure with new technology</td>
</tr>
<tr>
<td>Singapore</td>
<td>Economic boom lead by car-usage growth</td>
</tr>
<tr>
<td>Bogota, Colombia</td>
<td>Global south; social spatial inequalities; priority given to people and public transport</td>
</tr>
<tr>
<td>Sweden</td>
<td>Road safety &amp; human scale considerations</td>
</tr>
<tr>
<td>New York City</td>
<td>Extensive car-usage and public spaces</td>
</tr>
<tr>
<td>Trigger (Who)</td>
<td>Implementation of new high technology trains carriers using old stations creating higher opportunities and choices to travel</td>
</tr>
<tr>
<td>Reason of Selection</td>
<td>Many economic and spatial policies was implemented by the government to reduce car's on road and as a choice of transport mode</td>
</tr>
<tr>
<td>Sphere (What They Did)</td>
<td>Implemented bus rapid transit systems from favelas (slums) at the periphery to inner city, also giving it a higher priority and dedicated lane system</td>
</tr>
<tr>
<td>Why They Did So</td>
<td>To control the growing car culture</td>
</tr>
<tr>
<td>Spatial Effects</td>
<td>To increase social equity in the city and increase usage of public transport</td>
</tr>
<tr>
<td>Application in Delhi</td>
<td>There is already ample infrastructure resource in Delhi which are under-used or abused. Delhi's roads occupy 21% of the city land; there is sub-urban rail that is only used for goods</td>
</tr>
<tr>
<td></td>
<td>Delhi is going through the same car culture surge as in 1980s Singapore did; government is already removing subsidies on oil consumption and therefore could implement stronger policies on car usage by using the carrot &amp; sticks implementation as used in Singapore; a method that has worked money loan systems for housing and education in India</td>
</tr>
<tr>
<td></td>
<td>Seeing the fatality rate is rising in Delhi it is must that we think about road safety; speed limit and lane separation methods are only possible with parallel policies connected to car reduction</td>
</tr>
<tr>
<td></td>
<td>This method can be only adopted once public transport becomes more evident on the road and there is car-usage reduction; at the same time using the method of implementing an idea as an experiment works in a better way at the time of acceptance of the idea.</td>
</tr>
</tbody>
</table>

Another part of case studies of good practices is the technological aspects of the project which shows trends, usage and importance of using technology to inform the project. This is just a list of practices that has success stories in terms of its design and usage-ability as per the context. This segment is important to reflect on what technology should be develop to serve the Delhi's context and its spatial implications.
This segment discusses the different spatial analysis and arguments that can be used for implementing pedestrian friendly and sensitive design. This is crucial as many times implementations and design of pedestrian systems in India have been fought against and ridiculed as being to liberal with space, whereas the numbers using walking as a mode is higher than the number using private motorized traffic. Therefore topic of walkability should have sound reasoning in the Indian context. Thus, making it an important part of my design process.

1. Jan Gehl’s mode usage vs space allotted diagram and the distance that can be covered by pedestrian and how the activities should be linked. Source: Gehl, Jefferson Street

2. Arrogance of space: a method to reduce motorized traffic by seeing the pattern of each mode and space it covers and actually required compared to mammoth infrastructure that is built for it. Source: Copenhagenize.com

3. Economical: Funding and possibility to execute the New York Highline in a real-estate hungry city. By selling the surplus build-up that can be made if highline is removed to the new developments coming around. Source: New York Planning Department

4. Charles Correa’s dual usage of footpath to accommodate hawkers and homeless in Mumbai. The function of the large pedestrian way changes from night to day and also gives an area to hawkers that provide service (goods and refreshments) to the pedestrians.
PEOPLE AND QUALITY OF LIFE: DELHI

BUILDING TYPOLOGY

MODE OPTION

Slum and resettlement colonies
Old city
Post-independence
Green fields
Villas

Delhi Land-use 2011; source author adapted from DDA, 2007
PEOPLE AND QUALITY OF LIFE

DIFFERENT INCOME GROUPS & THEIR COMMUTE TO WORK

I studied special cases of people depending on their economic background, how they commute too and from work, time spent, quality of their lives in their perception, living conditions and percent spent on traveling cost from their monthly income.
I conducted a questionnaire in the summer of 2014 of people’s perception of their daily commute in school (St. Columbus), offices (Schenck Roltec, Noida; Dhampure sugar Mill, Delhi) and Localities of greater NOIDA. With total questionnaires filled 156.

Aim of the Questionnaire: To understand people’s perspective regarding Indian cities and its many dualities especially on the aspects of mobility and different strata’s of society.

As a conclusion I am putting two drawings, one shows what people think their quality of life should be and where it is going and second the dual perception of the same road indicating the absence of realization to the urban environment and urban decay felt during the commute.
LOWER INCOME GROUP

55%

22.1% 38.8%

TRANSPORT MODE SHARE

₹ for 10 KM

5 5 12 15 20 25 50 89 151

INFRASTRUCTURE SHARE AND DEVELOPMENT EMPHASIS

lack of infrastructure accessibility mixed traffic and lack if development priority target audience mis-match petrol subsidy & cheap model availability

source: author
DESIGN GOAL

GOAL: UTOPIA TO DESIGN

The design goal from my project comes from my utopia of walk-ability and the network of high-speed and pedestrian network combinational works. Thus the diagram below suggests. The aim is such to provide the city with affordable and accessible public transport network (especially for the socially and economically marginalized group) and reduce car usage which is unsustainable both as a mode of development and environmentally.

Thereby the project requires a critical look on Delhi’s transport infrastructure on a strategical point of view. To insure usage of public transport for longer distances and pedestrian pathway connecting to these high speed link for dual purposes, as a support to the network & safer and accessible exchange within the neighbourhood.

Thus, a re-interpretation of the utopia of this project where the peripheral high speed transfer of the districts results in strong public transport link connecting the various functions to the areas where lower income group stays. And walk-ability of the districts results in neighbourhood level intervention by down-sizing extensive infrastructure for car traffic into pedestrian only zones which cuts across socially marginalized groups and gated communities and further connecting to the public transport network. Hence trying to achieve a balanced urban transformation.

LINK BETWEEN GOAL AND RESEARCH & THEORY

The end products of my project is in four parts as it’s a multi-scalar issue and how should it be implemented:
1. Transport strategy that is affordable and accessible for national capital region of Delhi.
2. Spatial look of this strategy at a neighbourhood scale
3. A phasing plan for the strategy

Policy Package & Phasing Plan
Literature Review & Context Study

Strategy: City Scale Technology and context
Literature review Perception of commute
Ripple effect of Utopia

Design: Neighbourhood Level urban models: Functions & connections
Case studies: Space and design analysis
Case Studies: Different income groups
Ripple effect of Utopia

Theoretical Framework
Utopia: walk-ability
Socially Marginalised Group & Centre
Rail and Road Network
City’s Framework: Context

City's Framework: Context
Socially Marginalised Group & Centre
Rail and Road Network

City’s Framework: Context
Socially Marginalised Group & Centre
Rail and Road Network

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City’s Framework: Context
Socially Marginalised Group & Centre
Rail and Road Network

City’s Framework: Context
Socially Marginalised Group & Centre
Rail and Road Network
The project stems from accessibility to the city and its urban resources. So the main question to be answered first before going forth with design development was - Accessibility to what? and for whom?

This resulted in a further inquiry of why is the city not accessible, who is excluded and how are they coping or not currently. This has been answered in my research phase extensively, and the conclusion that I had put forward was that in Delhi resource shortage is not the problem but its allocation. The economically weaker population is not choosing to live far from work but are pushed out to city's shifting urban periphery with little or no resource. This urban push is in the plight to make the city aesthetically pleasing for achieving global recognition. Thus to me it's a city of unbalanced urban transformation, where being a global city is far bigger goal than right to the city.

My choice for the project's design phase thus resulted to a utopia of demand based allocation of mobility and urban space in its network and infrastructure. A utopia for walking which comes from the 50% of the population that walks in the unsafe and unaffordable roads of Delhi, a utopia where people can demand this right and yet not be labelled an activist but a citizen asking for the urban commons that they rightly deserves, a utopia of the diverse social mix that usually the city claims to be, a utopia for a better tomorrow, advanced yet humane.

This was a long list of utopias which made the ingredients for Delhi-on-demand system. A system that is run by the people for the urban common, which links a pedestrian to the city and the city with its population. Instead of a general top-down allocation, the resource of transportation (speed scale), streets & networks (walking scale) and urban space (still scale). It integrates to an extent that one can demand ahead, their right to walking space to their destination before even reaching there, right to urban public space and right to public transport in the city network thus connecting from home (200m maximum accessibility range) to destination (60km maximum accessibility range) as per implementation of the technology.

This technology is meant to adapt itself with the given network and by understanding its capacity it delineates space for the intended mode (selected), also it in-turn adapts the urban system to change with the technology which is demonstrated ahead in the design chapters.
Technology

A Smart City? Delhi-on-Demand is a system that aids the current smart city movement. This technology gathers the demand of commuters (speed or walking) and urban residents (public spaces) and interprets the spatial requirement and changes the city’s infrastructure accordingly. Thus creating a real-time dynamic system of demand and supply. Making a city smarter by having a demand-based supply chain management.

The technology sprouted from the current issues of poor allocation of urban resources and lack of accessibility for economically weaker residents to the city. Thus, the technology conceptualised is based on demands that can be made for travelling per neighbourhood, henceforth increasing the priority to not only provide public transport to those neighbourhoods but increase its availability and frequency to the said neighbourhood as per its density vs demand output. This combines with the utopia imagined of walkability by making public transport available within a certain accessibility range per neighbourhood and filtering out private transport in each range circle. Thus, a city (Delhi) that has an approximate diameter of 60km, is broken down to walkable districts and neighbourhoods and intra-city travel of distance larger than 2km can be travelled using public transport.

The technology helps to realise where the need is and how much should be allocated similarly. Hence bringing the resource closer to people who need it and demand it from the city.

The technology works on selected routes which have high connectivity and functionality as per the scale requirement, and a tool box of design elements have been created as per route type, width and conditions that can be applied if different case scenarios. The design elements that are direct resultant of the technology are technical and symbolic type; whereas the precipitated resultants are those that initiate social, cultural, economical and service aspects which covers the soft aspects of urban design.
Delhi faces high intra-city travel as the centre of works are concentrated whereas the people have been displaced throughout the city especially the economically weaker on the fringes. This scale make accessibility an affordable and safer option through public transport and at the same time comfortable through surge point interventions and changing lane concept which are operated by the system which is fed by demand data collected per user. Thus its shows how technology operates the urban design and planning of the selected routes which allow higher speed of travelling.

Intra district connectivity is challenged at this scale. Delhi districts mostly contain each with more than a million population. Therefore it is essential for the system to react to travel and connectivity within districts which are mainly based on motorised traffic which are either privately owned or hired. The system thus tries to break the large district into neighbourhoods and splits the system into connecting these neighbourhoods via public transport which due to the range are difficult to walk; whereas neighbourhoods themselves are resource with dynamic walking streets connecting daily basic function and activities and inter neighbourhoods connecting non-daily but essential administrative and economical activities. It aids people with a walk-able solution to daily chores which are otherwise hindered with motorist and polluted which parking and / or physical obstruction of routes.

The still routes are instilled within each neighbourhood to make permanent add-ons to the existing network which help in balancing the neighbourhood in its lack of social and cultural meeting places, space for informal economy which is quite prevalent in India to grow; urban commons like playgrounds, plaza and services life sanitation (for JJ Clusters) and lighting to increase safety measures.
Conceptual example for start and destination with various conditions and reaction of system as per demand when it increases and decreases peaking at 9:00 am.

**SCENARIOS**

- **Below Capacity Priority**
  - Base Line
  - Medium Priority to first Surge point and later route
  - High Priority to first Surge point and later route
  - High Priority to first Surge point then Medium Priority the route later
  - Base Line to first Surge point and later route
  - Base Line

- **Medium Priority**
  - High Priority to first Surge point and later route

- **High Priority**
  - High Priority to first Surge point then Medium Priority the route later

**RULES : CAPACITY CONTROLLED DEMANDFULFILMENT**

- **HIGH PRIORITY**: 75% and above capacity of maximum carrier in the mode type with demand made within half the distance to next surge point.
- **MEDIUM PRIORITY**: 50 - 74.99% capacity of maximum carrier in the mode type with demand made within half the distance to next surge point.
- **BASE LINE**: 25 - 49.99% capacity of maximum carrier in the mode type with demand made within half the distance to next surge point. In this request the bus anyway runs every half an hour.
- **LOW PRIORITY**: Below 24.99% capacity of maximum carrier in the mode type with demand made within half the distance to next surge point. Also, the carrier of lower capacity is taken thus making demand for the mode used as 50%.

**PHYSICAL CONDITION OF SYSTEM**

- **END OF ROUTE**
- **SURGE POINT**
- **Surge Point = Intermediate start and end points**
- **60KM CITY LIMITS**
- **20KM**
- **Sampling for request processing done periodically**
- **10KM**

**RESOURCE CONDITION OF SYSTEM**

- **Bus Capacity**: 250 seats
- **Bus Capacity**: 150 seats
- **Mini-Bus Capacity**: 50 seats
- **Passenger Train Coach Capacity**: 200 seats
- **Freight/Passenger Train Coach Capacity**: 100 seats

**RULES PER CONDITION OF SYSTEM**

- **BUSINESS PROCESSING**
  - Technology
The city analysis was mostly covered during the research phase of the project, following are few key elements and drawings that were considered as essential to developing a strategy - connectivity (space syntax), landuse, housing typology, economic mobility, centres and routes that are harmful currently for pedestrians and cyclist.

As the design revolves around providing accessibility to the city, especially for the dislocated of economically weaker sections, high density neighbourhoods, analysis of the above stated data/map helps in focusing the design around functionality, network and healthy urban environment.
DELHI'S LAND USE AND SLUM LOCATION

City - Analysis

Delhi Land-use 2011; source author adapted from DDA, 2007

Slum Location 2011; source author adapted from DDA, 2007
District wise area, population and economic statistics in National Capital Territory of Delhi; source author's diagram adapted from table Thakuriah, 2009

District wise employment statistics in National Capital Territory of Delhi; source author's diagram adapted from table Thakuriah, 2009

Delhi’s transport network and different industrial and commercial centres, source author adapted from Koshy, 2014-TU repository
Critical Road sections for pedestrian accidents in Delhi, 2006-09 by Rankavat and Tiwari, 2013

Density map for pedestrian accidents in Delhi, 2006-09 by Rankavat and Tiwari, 2013
Various tools of analysis have been used to understand the reality of the most densely populated district of India, which lies in North-east in the city of Delhi.

I looked into facts and numbers by various research papers and census of India to understand the demographic profile of the area and its growing and working trends.

The study of arrogance of space was used to understand the priority and space given to each mode within this site.

Space syntax was used to understand the connectivity of the site within the district and its connectivity to the city.

The study of functions in the site gave a broader view on the result of space syntax and also its limitations which were created by density and sometimes local function could be seen in interior streets which are not that well connected further outwards.

Leading to a comprehensive socio-spatial analysis of the site which forms the base on which the design is built on, which is further explained in the following chapters.

As discussed earlier in the technology chapter, the different scales where design and strategy is executed - speed, walking and still scale. To demonstrate this technology into design, three sites of 500m diameter were selected within the chosen district of ‘Shahdara’.

The trial site 1 demonstrates speed scale interaction to the neighbourhood. The trial site 2 shows how the neighbourhood works within with the public transport and walking routes. And finally trial site 3 is where the design explains the walking neighbourhood and how life would change in the living environment.
WHY THIS NEIGHBOURHOOD?

DENSITY: Shahdara is not only the most densely populated in Delhi but also in India, with population density accounted at 37,346sq/km (Census of India, Municipality of Delhi, 2011).

WORKERS TO JOB: Shahdara has the highest population density and one of the lowest percentage of business enterprise percentage in Delhi (12.02%); whereas the job to workers ratio is again lowest in Delhi at 0.83. Making the resident travel further out of the district to find a job (Thakuriah, 2009).

HOUSING TYPOLOGY: Shahdara has mixed typology of JJ cluster (illegal housing made of temporary material), illegal colonies from the time of the 1947 partition, illegal housing colonies, mid-rise made by Delhi Development authority and new high-rises as gated communities.

JJ CLUSTER AND ILLEGAL COLONIES (from 1947): More than 50% percent of the site faces housing in congested conditions which lack basic services and urban common (Bhavikar, 2003).

EAST DELHI MUNICIPALITY: The municipality that Shahdara falls under is the poorest in Delhi, which major resources diverted to south Delhi due to higher income households in that district. It faces maximum the poor allocation of resources in Delhi’s image based planning. (Urban age conference LSE, 2014).

WATER ZONE: As being subjugated to poor resource allocation, the district also faces one of the slowest in water supply and sanitation services that is worsened by the high density. (Census 2001, check appendix for maps).

HISTORICAL RELEVANCE: Shahdara was resettlement from the time when Delhi became the Mughal Kingdom’s capital and is considered part of Purani Dilli (Old Delhi).

SYMBOLICAL: Shahdara’s name comes from Urdu language, in which it means ‘doors of kings’ from Persian language where Shah means king and dara means doors. Thus symbolically linking to the design ideology of using a gate’s system which is closing and opening of a object as per the demand made and thereby controlling the kind of traffic and type of modes.
### Demographic

#### Population

<table>
<thead>
<tr>
<th>Region</th>
<th>Population</th>
<th>Population density (persons per sq km)</th>
<th>Sex ratio females per 1000 males</th>
<th>Geographical Area (km)</th>
<th>Level of urbanization (%) in 2001</th>
<th>Population decadal growth rate (%) in 2001</th>
<th>Main working population</th>
<th>Non working population</th>
<th>Marginal worker population</th>
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</thead>
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</tbody>
</table>

### Education

#### Literacy rate

<table>
<thead>
<tr>
<th>Region</th>
<th>Literacy rate (%)</th>
<th>Adult literacy rate (age +15)</th>
<th>Gender Gap in literacy rate (%)</th>
<th>Household and Living condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORTH EAST</td>
<td>82.8</td>
<td>74.3</td>
<td>15.8</td>
<td>Number of households</td>
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<tr>
<td>NEW DELHI</td>
<td></td>
<td></td>
<td></td>
<td>Living in own house</td>
</tr>
<tr>
<td>CENTRAL</td>
<td></td>
<td></td>
<td></td>
<td>Household who own mobile phone</td>
</tr>
<tr>
<td>NORTH</td>
<td></td>
<td></td>
<td></td>
<td>Household who own motorized vehicle</td>
</tr>
<tr>
<td>NORTH WEST</td>
<td></td>
<td></td>
<td></td>
<td>Household who own television</td>
</tr>
<tr>
<td>NEW DELHI</td>
<td></td>
<td></td>
<td></td>
<td>Household with Toilet facility</td>
</tr>
<tr>
<td>CENTRAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NORTH</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NORTH WEST</td>
<td></td>
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</table>

### Household and Living condition

#### Number of households

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of households</th>
<th>Living in own house</th>
<th>Household who own mobile phone</th>
<th>Household who own motorized vehicle</th>
<th>Household who own television</th>
<th>Household with Toilet facility</th>
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<td>45</td>
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<td>97.4</td>
</tr>
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<td>45</td>
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<td>45</td>
<td>89.9</td>
<td>97.4</td>
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</table>

Census comparison between Delhi's districts and its satellite cities; Census of India, 2011 & UNICEF
A point location within the district (Shahdara) chosen (above) shows how massive infrastructure for motorised traffic is dropped down in a place where everyone only affords to walk.

This creates a huge highway to be occupied by pedestrians at peak hours in traffic and also a situation which is not safe for them due to the high speed traffic moving on that road.

Also it displays the disconnection of the location to public transport which is to where it is needed and where they are located on such routes.
Through space syntax the chosen district ‘Shahdara’, shows the speed routes of the area which acts as more a through road than as binders for within the district. These roads highlight important roads for the district as well as surrounding areas that helps connect to central Delhi.

The roads are encroached with activities that have a large catchment area (maximum 30km) and serve residents even outside the neighbourhood.
A local integration in space syntax of the district revealed the essential connectors within the neighbourhood. These roads are speed routes for vehicles and short-cuts for pedestrians. They serve as connectors for mainly the residents of the district of 'Shahdara'. Hence on these roads one can find activities or function which have a medium or small catchment area (0.2-5km) and make up the necessary resource requirement for the neighbourhood to function.
Arrogance of space is a study conducted to understand the ratio between usage and space given, through it one can understand the priority and hierarchy of each mode in the network and neighbourhood (urban space).

Through this studies I understood the spatial configuration of the district of Shahdara and realised that there is no room for a pedestrian in most streets and usually are left to make a pseudo shared street which is governed by motorised traffic as demonstrated in the following pages.

The study was re-purposed in the context of Shahdara, factors considered was the spatial usage by vehicular or non-vehicular traffic to the space given for either in the road/street design. For this various types of routes and sizes were considered to gage difference of street use vs their location in the district.

This study helps facilitate the understanding of function, their catchment area and how one accesses them in the current scenario.
70% of slum residents in Delhi find commuting to work most dangerous aspect of their work (Hazard centre, 1998)
Through this map one delineates the housing typology and the function distribution around it. As I observed that the functions largely depend on the route type and try to service a larger flow of population, but with housing one can also see that many functions resonate with type of housing it is attached too. For example the JJ Clusters (temporary housing with a slum typology) is deprived of many functions within their community; whereas the gated communities have higher percentage of open space resource, leisure areas and community based functions integrated with it compared to rest of the neighbourhoods.

The purpose of this map is to see which areas are deprived and how can one design to give them a accessible network to functions at the same time induce certain function within these neighbourhoods when designing the network typology.

(For a detailed function mapping, refer appendix)
Space syntax is an amazing tool to understand the connectivity of a given network and also indicated thus where most activities is popped up. Similarly density also has a similar function. And given the scenario and working with India’s densest district, sometime gave obscured function to route connectivity. Thus I approached my strategy through the order of the following rules:

a) Route selection hierarchy for different scales (speed, walking and still) according to the connectivity they give

b) the functions in the neighbourhood made the second layer of twisting around with the routes.

c) typology of the route

1. For speed in is necessary that they use wider roads, are best connected and approachable by all also higher the width it should always border a neighbourhood but never cut across

2. For walking routes, these were selected every 500m on their connectivity to speed scale and would always cut across the neighbourhood to engage with a large audience.

3. For still routes, they usually disconnected with speed routes and always bordered the walking route instead. They were selected with their lack of functions which have a larger catchment area and disrupt the a softer social life of the neighbourhood.

These routes are also demarcated by gateways to symbolised and use the features of a doorway which is to regulates traffic. Each of there doors have a meter to access the demand system to make a demand. The doorway is used as a design element and is elucidated further in design chapter.

The routes always have a portion exclusively demarcated to pedestrians and which phasing one reaches the utopia of walk-ability.
The Dynamic system while controlling flow of the registered demand, also changes the urban system to make it comfortable for the ones travelling in public transport or by foot. It does so by strategy based on accessibility to various functions, design elements injection and further they are safe guarded by policies. The phasing suggested notices the current trends and practices in the political system of the city and country and tries to take advantage of it to reach utopia of walk-ability.

The route distribution and hierarchy in itself is taken as the point for a strategy, where a route’s width doesn’t just suggests the amount of flow of traffic but also the type of mode on that route and how it facilitates a healthy, affordable and accessible way to access the city through public transport and by walking in otherwise personal motorised transport depended Delhites.

Delhi - on - Demand system makes it possible to achieve the utopia of a walk-able metropolitan city, with an healthier and safer environment. An urban environment that through the system can be shared by everyone and is instructed by the demand of everyone, making it for the people, from the people and of the people!
As explained the routes are divided further into hierarchy of the speed one is moving at, the kind of transport is available to them through the Delhi-on-Demand system and the distance that can be covered optimally on this route before it intersects with a similar route further. The routes are as follow:

A) Speed Routes
1. Railway line covering intra city distance of 60km
2. City Speed route | Bus | 30km
3. District Speed Route - Primary | Bus | 5km
4. District Speed Route - Secondary | Bus | 2km

B) Walking Routes:
1. Footpath | Walking | 1 - 5km
2. Dynamic Walkway | Walking | 500m

C) Still routes:
1. Urban space (streets) closed for motorised traffic | social, cultural, economical | 200m

These routes follow these rules to make the on-demand network and are directly linked when one demands a particular space and indirectly linked as the load of walking and still route is transferred to speed traffic making the dependency of public transport higher as a result of its efficiency and ease of movement within the speed routes for larger distances when compared to personal motorized traffic.

It earlier that every route has a certain function that it connects the resident with and each mainly handles the load for a particular function as donated in the adjacent figure.
The Space syntax tool is used as an indicator for selection of route for this route divide at various scale - Speed(city), walking(district) and still(neighbourhood).

On the City scale taking the topological choice of 50km and seeing the wider network for intra and inter city travel to understand which routes should be given priority in the system as city speed route. There route work with the intra-city rail network to form the systems long distance travel and thereby making functions which have a large catchment area or for people who have been displaced to the outer fringes of the city under the various slum resettlement schemes.

This network also open the city in off-demand time for freight corridors which were earlier not possible, during the day time and were only allowed from 10pm to 6am

These routes also contains a strategic design elements called surge points and like a surge gate in a water systems, these points are in the network for the relief, expansion of stay of different modes of public transport. This is further explained in the design element section.

The reason why the scales are named on movement is not only for project’s focus humour but also that they give a sense of how would a person experience an urban space in that scale. The size description doesn’t justify this feeling of a urban dweller and hence the speed, walking and still scale names have been adopted.
Topological choice 5km superimposed on Shahdara's district network and large catchment function ring as per city speed route.
Function Ring

HOW IS IT USED AND BY WHICH MODE?
Percentage of mode type in a road Section

Priority Mode type

ROUTE'S ACCESS RANGE
Route Type: City Speed Route

Private mode entrapment

City speed route selected shown in part in Shahdara - the project's experimental district
CITY SPEED ROUTE

Existing - Diagram

Non Active - Diagram

Active - Diagram

Strategy
Topological choice 5km superimposed on Shahdara’s district network and large catchment function ring as per district speed route
WHAT IS MADE ACCESSIBLE?
Function Ring

HOW IS IT USED AND BY WHICH MODE?
Percentage of mode type in a road Section

ROUTE'S ACCESS RANGE
Route Type: District Speed Route (Primary)

Primary District speed route selected shown in part in Shahdara - the project’s experimental district
Combined Topological choice 5km and 500m superimposed on Shahdara’s district network and large catchment function ring as per district speed route.
WHAT IS MADE ACCESSIBLE?
Function Ring

ROUTE’S ACCESS RANGE
Primary District speed route selected shown in part in Shahdara - the project’s experimental district

HOW IS IT USED AND BY WHICH MODE?
Percentage of mode type in a road Section

Priority Mode type

ROUTE’S ACCESS RANGE
Route Type: District Speed Route (Secondary)

Secondary District speed route selected shown in part in Shahdara - the project’s experimental district
DISTRICT SPEED ROUTE (SECONDARY)

Existing

Delhi-on-Demand Visual Strategy
DISTRICT SPEED ROUTE (SECONDARY)

Existing - Diagram

Non Active - Diagram

Active - Diagram

Delhi-on-Demand Visual Strategy
Combined Topological choice 5km and 500m superimposed on Shahdara's district network and medium catchment function ring as per neighbourhood walking route.
WHAT IS MADE ACCESSIBLE?
Function Ring

ROUTE'S ACCESS RANGE
Private mode entrapment

HOW IS IT USED AND BY WHICH MODE?
Percentage of mode type in a road Section

Priority Mode type

ROUTE'S ACCESS RANGE
Route Type: Neighbourhood Walking Route

Strategy

Neighbourhood walking route selected shown in part in Shahdara - the project's experimental district
Existing Approach to a religious centre

Approach to a school

Shopping street

Residential street

Delhi-on-Demand Visual Strategy
Combined Topological choice 5km and 500m superimposed on Shahdara’s district network and small catchment function ring as per neighbourhood still route
NEIGHBOURHOOD STILL ROUTE
STILL SCALE FUNCTION AND SPACE SYNTAX

The still routes occur every 200m, thus for these routes a more thorough study at neighbourhood level is required compared to other routes. As it requires softer characters of urban life of social interaction and cultural and economical growth at local or community level. Therefore it is important to test the routes on also these basis for which three different trial sites selected in the district to test how would the urban design/fabric function with Delhi-on-Demand system.

WHAT IS MADE ACCESSIBLE?
Function Ring

TRIAL SITE 1 : 500m Ø

TRIAL SITE 2 : 500m Ø

TRIAL SITE 3 : 500m Ø

Isovist Path superimposed on Shahdara's district network and medium catchment function ring as per neighbourhood still route.
NEIGHBOURHOOD STILL ROUTE

HOW IS IT USED AND BY WHICH MODE?
Percentage of mode type in a road Section

ROUTE’S ACCESS RANGE
Route Type: Neighbourhood Still Route

Private mode entrapment

Route distribution
- bus lane
- walking route
- still route

Neighbourhood still route selected shown in part in Shahdara - the project’s experimental district

TRIAL SITE 1: 500m Ø
TRIAL SITE 2: 500m Ø
TRIAL SITE 3: 500m Ø

NEIGHBOURHOOD STILL ROUTE

100% 0% 0%
The design elements have been categorised into five categories:

1) Technical: Elements that facilitate the operation of the dynamic system Delhi-on-Demand.

2) Symbolic: These are elements that act as a remembrance of old planning methods in historical cities and current elements of road design. Symbolism is key method to familiarize the residents to the design intervention faster.

3) Social: These elements are added in more interior routes which are mainly residential. They are added to induce urban public space.

4) Cultural & Informal economy: In Indian traditions most of the festivals are celebrated in open community areas. Cities lacking such space, streets are in-formalised to serve this purpose from time to time. In the same way informal economy (street hawkers and vendors) form a large part of urban economy and bring certain functions that are lacking in the neighbourhood. But with increased formalisation of Indian cities they are being pushed away. Thus, these elements provide the necessary space for them. As the are Dynamic these spaces are occupied only when demanded, hence optimising the urban spaces currently used as dump or parking.

Service: The elements in this category are introduced as an added benefit of this technology, in areas or fields that lack them. They thus service the design and technology to improve urban environment and safety.

These elements have been further allocated as per their way of functioning in the system as permanent or dynamic elements.
Surge Points:
These are bus and train depots where either bus changes or coaches can be added to trains to increase their capacity, making it a relief point for the mode. The also in turn can reduce in capacity seeing the decrease in demand on further route. Seeing the two mode, their limitation comes in level of cost reduction through this method. The bus has the flexibility and actual running cost reduction, whereas the train faces reduction cost only in maintenance of coaches through this method. Thus attaching the coaches to already running freight trains is a better economical model for the mode.

The diagram variance show the extreme situations that can happen when it comes to modes interaction with the surge points.

Using different capacity buses is the chosen model with the given system and its design; for train a simplest way is adding coaches for high and medium priority but for base line and low priority may be redesigning coaches that are dynamic in their distribution of freight to passenger would be ideal.

Diagram variance show the extreme situations that can happen when it comes to modes interaction with the surge points.
TRIAL SITE 3: This trial site displays how the a neighbourhood itself functions alone in the Delhi-on-Demand system. Thus showing the usage of meter for demanding walking space within the neighbourhood connecting daily based activities and accessibility outwards to the district. It shows how accessing school, shopping for grocery, space for social interaction & informal economy can flourish using the new technology.

TRIAL SITE 2: This trial site displays how the a neighbourhood connects to the district which links further to the city based accessibility. Therefore on this site the meter acts to display not only the demand route but also dynamic walking routes and how a J.J. Cluster will be able to access the routes and how it helps in initiating accessibility for all. The walking time is moderate due to the presence of demand speed routes within these neighbourhoods.

TRIAL SITE 1: As the meter exists at every route, thus its presence is on all trial site, starting with the first phasing route, which are speed routes that this trial site displays well, is how the district is attached to city speed routes. Therefore the site displays how larger city functions that can be accessed by speed routes are linked to the district. This site helps in noting while designing the urban systems to adapt to Delhi-on-Demand system by why and where the meter is checked in and out. The walking time is lesser in this site as its closer to main city route for city based accessibility.

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TECHNICAL

Permanent
Dynamic

METER

Functions Accessed

Occurrence: Route Type

- 60 KM
- 5 KM
- 2 KM
- 500 M
- 200 M

METER (All Routes):

Design Element type: TECHNICAL

It occurs on all route types as through its public can demand public transport on speed route, walking and public space in walking route. They also exist in still routes but do not directly engage in its spatial transformation over they day but because other routes take the load of these routes that get converted into non-motorized vehicular space that is administrated by the meter and in-turn the Delhi-on-Demand system. Functionally thus the meter interacts with various design elements of the system directly or indirectly. But also makes accessing various activities and functions that the city provides.

Meters play a vital role in phasing as the location development controls the development of Delhi-on-Demand system.
TRIAL SITE 3: The Bollards are absent in this trial site which was selected for showing walk-ability within the neighbourhood, which functionally is opposite to what traffic bollards are assigned to which is administrating high speed traffic.

TRIAL SITE 2: The trial site 2 is where one can see the transition from walking route to district speed routes thus here the dynamic walking route have been translated to permanent footpath to ensure safety and dis-attachment of it from the system is at speed route is considering priority to public transport and making a permanent way for a walking individual. Therefore the bollards only engage in the speed traffic flow and don’t control the foot traffic.

TRIAL SITE 1: The trial site is closest to speed route and also is divided by the district speed route, thus the bollards are best demonstrated on this site as per its functionally, showing the transition from district to city speed routes at ‘city gate’ design element. While designing this junction was integral for working our how would a district attach itself to the city and how and which mode should get the priority and that walk-ability should be clearly segregated from the speed route due to the nature of route.

TRAFFIC BOLLARDS

Function Ring

Occurrence: Route Type

Traffic Divider

In - build fining screen

Dynamic bus lane maintenance

Design Elements
TRIAL SITE 3: Demand stops are absent in this trial site which was selected for showing walk-ability within the neighbourhood, whereas demand stop have occurrence on only speed routes.

TRIAL SITE 2: The number of demand stop reduces in this site as the mixture of walking route to speed route is increased. But are still relevant to show that there is a stop increase when it comes to walking and still route intersecting with speed routes and there in turn making accessing the city for JJ cluster dwellers easier which were otherwise blocked by traffic routes around its borders and yet neglected from connectivity to the city.

TRIAL SITE 1: Many demand stops occur on site 1 due to the presence of speed route also showcasing where the stops occur when it comes to walking route meeting the speed route. These stops thus are physically present all day but are dynamic in terms of functionality.

DEMAND STOPS

Function Ring Occurrence: Route Type

DEMAND STOP (Speed Route):
Design Element type: TECHNICAL
Demand stops are bus-stops or train station which fall on speed routes both district or city which are exists on the confluence of Delhi-on-Demand network, such that one can take the still route and walking dynamic route for safe walking to the speed route and create their own demand stops. Thus as per walking route rule that exist every 500m, so does demand bus-stop occur every 500m. The demand station exists only at the intersection of the train like with speed route therefore they occur at a distance of every 2-5km. The operator of the mode gets the signal for stops where to stop while picking passenger and not stop of stops that do not demand a stoppage. Therefore resources (time and stops) are distributed where demand is made. One can make a demand from home and thus insuring a stop even in a hurry.
TRIAL SITE 3: City gates are absent in this trial site which was selected for showing walk-ability within the neighbourhood, whereas it exists at the intersection of speed routes.

TRIAL SITE 2: City gates are absent from this site as well due to lack of any intersection of speed routes of city with district. It also indicates that one is much more in the interior of the district, therefore gates symbolically indicate where you are and which route one should follow to reach a desired destination. One can follow the district speed routes on site to reach the city speed route. This hierarchy helps to positioning yourself in the city which is otherwise difficult to decipher as all streets are occupied by private motorized vehicle and the width only indicates the amount of traffic.

TRIAL SITE 1: The city gate occurs once on this trial site indicating the width of district route, also it further due to its height of opening is the only gate that allows freight movement in the district, thereby restricting the function of unwanted neighbourhood functions like good-downs and large freight storage and factories where residential activities are.

CITY GATE (Speed Route):
Design Element type: SYMBOLIC
The city gate design element only occurs at the intersection of district speed route to city speed route. It marks the route selection for the Delhi-on-Demand system. Thus it deals with speed traffic as well as due to its design with foot traffic, it's a permanent feature in the network. While being used symbolically to depict an entry to a district it also has features for signage, signalling and priority lane for the speed traffic flow, while keeping pedestrian gates within it as a permanent and only symbolic function.

It lets a passenger know they have entered a district and therefore are likely to encounter other types of routes from the system as the travel inwards. While phasing, they occur earlier on in as being part of the speed route network.
Existing

CITY GATE

Delhi-on-Demand Visual
Design Elements
TRIAL SITE 1: As the site is a way to examine the case interior to a neighbourhood, therefore apart from absence of occurrence of the particular gate, it is also not appropriate for a space that attracts a larger community approach. Thus its absence in this case scenario.

TRIAL SITE 2: This site is a mixture of speed route and walking & still routes an is ideal result for catching a large audience for a community space. This gate can be reached from within the neighbourhood in various modes of travel - walking and public transport making sure that the intentions of a gate and the space attached is met with approachability.

TRIAL SITE 3: The site lacks a common junction between district routes and therefore lacks these particular gates. Also being on the edge of the site these gates are not used due to lack of the appropriate catchment area for the community based activity required.

**DISTRICT GATE - COMMUNITY (Speed Route):**

Design Element type: SYMBOLIC

This design element only occurs at the intersection of a district speed routes larger than 12m and has an addition activity attached when compared to city gate - community space. Firstly the occurrence controls freight traffic within due to height restriction caused by space above and secondly it occurs on large roads to engage in a large community based activity.

This space addition apart from its activities of signage and signal is a direct result from learning from the sites which lacked any common enclosed space in its highly dense urban environment. Also because of the site configuration it occurs more in the centres of the district, serving a large audience. Therefore in phasing it occurs when the district accessibility is under question.
TRIAL SITE 3: As the site is a way to examine the case interior to a neighbourhood, therefore is absent from the current scenario.

TRIAL SITE 2: The trial site lacks any condition of district route that intersect other lesser width district speed routes.

TRIAL SITE 1: The site displays when 6-7m width routes are intersected with city speed routes. One cannot place community gates due to not only width rule but also the catchment area for the community. Therefore for this condition the district gate is ideal for the selected Delhi-on-Demand route which controls fright traffic and as per is width still gives priority to bus on the route, making it sometimes bus only.

**DISTRICT GATE - BUS ONLY**

This occurs at the intersection of a district speed route larger than 6m with various other speed routes both city and district type. It helps in regulating traffic in the route ahead from a city speed route. It is a variates in functionality in smaller width route by making it dynamically through the demand rate a bus only route.

The gate is added in the design elements tool box to remove any anomalies in conditions and not to replicate many community based gates all over the place that reduces catchment area from one to another. Unlike the above speed gates this gate's phasing depends on the location and condition so it can occur earlier when incurred with city routes and later when there is a condition in district routes.
DISTRICT GATE - BUS ONLY

Existing

Delhi-on-Demand Visual

Design Elements
TRIAL SITE 3: As these gates occur being and end of the dynamic walk route, follows the rules similar to the route’s rules in terms of occurrence and function ring, and one can come across one within 500m of walking in any direction. The site is ideal to see this happening.

TRIAL SITE 2: This site has a mixture of almost all traffic flows (speed and foot), one can notice in the design of this site that the walking route doesn’t end or start therefore the gates are not indicated. Therefore during this site the walkway evolved its function which was later applied as a general rule for it. For the rule refer the site when dynamic walkway is explained.

TRIAL SITE 1: Similar gate is used when the walkway meets speed route, but as the half the width can be used my motorized traffic there for this site helps in solving the anomaly through signage on this gate when the walkway meets a bus only route as the time when the system has a high demand of the route.

Neighbourhood Gate - Guard - Dynamic Walk

Function Ring
Occurrence: Route Type

Automated guard cut-out to indicate the street was demanded for walking and now has converted to half walking routes

In - build fining screen

Design Elements
TRIAL SITE 3: As these gates occur with still routes one can feel their presence every 200m of any neighbourhood or district. Which this site as an example depicts.

TRIAL SITE 2: This site shows how one can walk through the still route to avoid a busy route which is indicated via this gate. While one is walking on these routes they can rest assured that they will never be bulldozed by speed traffic and can enjoy the company of residents that live on the street.

TRIAL SITE 1: The site should that still route occur irrespective of closeness to the speed route every 200m, and the gates mark a clear demarcation that one can enjoy a walk or access daily function no matter where they live in the neighbourhood.

NEIGHBOURHOOD GATE - TREE - STILL STREETS

Design Elements

These gates occur on still routes which are dedicated to zero motorized vehicular based activities and can be found in areas with higher percentage of residential typology. Their occurrence on the streets increase if they are intersecting with other routes to forbid traffic on still routes. Like the route it is dedicated, it has a tree at its centre point - a still object and also an obstruction for speed traffic. The gate like other gates has a fining screen to note down law breakers that enter the route with a motorised vehicle for a non-emergency based activity.

Following the rules of function ring and occurrence, in phasing as well it occurs later after one has established speed and then walking routes, while establishing still routes.
TRIAL SITE 1: The site demonstrates the network of footpath from different speed routes within the district entering the city speed route. These footpath extend to walking routes in form of dynamic walk during peak hours but closing the loop of a resident walking from inside the district outward to the city route where there is an option of public transport further for distances greater than 5km which are difficult to walk.

TRIAL SITE 2: The site depicts the diminishing need of a permanent feature of walk-ability in areas that are more residential having locally based functions.

TRIAL SITE 3: In the similar fashion as earlier speed route related design elements, the footpath which is a permanent feature is absent on the site which operates of dynamic waking more being interior in the district and facing more local residents travel and not crossing across travel.

FOOTPATH (Speed Route):
Design Element type: SYMBOLIC

The footpath are a permanent feature in any speed routes of Delhi-on-Demand system. They make sure the safety and availability of space for walking. After studying Shahdara through the study of 'Arrogance of Space', one realises the lack of walk-able space for the pedestrian in the current condition. This element is a traditional old element to road design but should be highlighted an essential integer of the system.

It is phased with the speed routes and as they are considered the first move to establish the Delhi-on-Demand system, so are footpaths which make sure even easier passenger accessibility to the public transport.
TRIAL SITE 3: The site 3 is an ideal for depicting of walking route connections within the neighbourhood making school, shops, health and small business which have smaller catchment area safely accessible by all ages.

TRIAL SITE 2: The site 2 depicts the ease that walk-able routes can provide in connecting to not only the public transport but informal and formal commerce of the neighbourhood. Its also brought to light that a raised platform the entire length of the route will further help in entrapping motorized traffic from at-least one side of the route, forcing the change in attitude of single driven motorist.

TRIAL SITE 1: The walkways show its power in connecting the inner neighbourhoods to the speed route for functions that require a longer accessibility route. They make super one can approach the demand stops or speed routes safety and comfortable. It also in-turn shows the power of common resident to work together to achieve walk-ability and motor related pollution free urban environment. A walkway that makes sure a slum dweller or economically weaker section of society is not denied to use to make it safer to travel in city which is considered the most hazardous environment (CO2 emissions) and highest road accidents rates in the country.

SYMBOLIC

DYNAMIC WALKWAY / FOOTPATH

Demand to be made : Calculations
1. $WALKWAY = 500 \times 2.25$ (average half width) = 1125sqm
1. person to take 2 steps takes 1.5m on average, take that as a square for any direction movement = 2.25sqm of space per walker.
Thus, at a given demand time maximum number contained in the walkway = 500 people

Urban common would be 50%, thus the demand required which is periodically checked to change routes to half walking is 250 people.

Shahdara’s density is 37,346 persons/sqkm, making the demand required as only 1.34% of the density.
Approach to a Religious Centres

DYNAMIC WALKWAY
Existing - Diagram

Non-Active - Diagram

Active - Diagram

DYNAMIC WALKWAY

Delhi-on-Demand Visual
Design Elements
Approach to a School
Approach via Shopping area
Existing - Diagram

Non-Active - Diagram

Active - Diagram
Approach through Residential area

DYNAMIC WALKWAY
Existing Diagram

Non-Active Diagram

Active Diagram

Half of Road width

Delhi-on-Demand Visual Design Elements
TRIAL SITE 3: The occurrence of still routes have been made such that its equally distributed throughout the neighbourhood. Thus this feature also is equally distributed to initiate social interaction in public space and give life and an eye to residential streets of the neighbourhood. This function is permanent and therefore not demanded but the luxury uncommon to Delhi’s street is only achieve in the last stage of phasing.

TRIAL SITE 2: One can notice these elements added centrally to JJ clusters and dense illegal post-partition colonies. Giving these communities which are strongly bonded in themselves an urban space to interact.

TRIAL SITE 1: Similarly the site that depicts speed of the system has also been engaged in balancing basic urban commons throughout the district as everyone needs a place to interact irrespective one’s economic and social stature.

SEATING (Still Route):
Design Element type: SOCIAL

Seating is provided as a design element due to the decreased amount or public spaces for social interactions per person in a highly dense districts of Delhi. These are permanent features with a variety to be placed centrally to the street or against a buildings wall. This depends of the width of streets. The element like the route they are affiliated to occur every 200m with the width of the street varying from 1-3m.

The permanent element when placed centrally have canopy which is operate-able manually. It is accompanied by other socially, culturally or economically activities which are usually seen on more residential based streets in India, with an added advantage of not being surprised by a motorist.
TRIAL SITE 1: Similarly the site that depicts speed of the system has also been engaged in balancing basic urban commons throughout the district as everyone needs a game of cricket from time to time.

TRIAL SITE 2: This not so common urban common is for all and thus one has to add it on the still route running centrally in the JJ clusters and illegal colonies.

TRIAL SITE 3: The occurrence of still routes have been made such that its equally distributed throughout the neighbourhood. Thus this feature also is equally distributed for kids in any neighbourhood.

Shahdara’s decadal population growth was 62% in the census of 2011, the highest of Delhi. Thus, one can assume at least of the contribution is the young population. But Delhi usually bannered under ‘Clean Delhi, Green Delhi’ is plagued by the usual issues that Indian cities faced that is urban spaces and especially playground. The current situation in Shahdara shows even a bleaker picture due to its density and privately owned or administrated parks. Thus, an element which encourages kids, who anyway play of the street with adjusted rules of cricket as ‘street cricket’ to enjoy their free time near their homes without worrying to be killed by a motorist in the midst of a catch. Or a kid flying kite to not worry about the roof’s limitation but be on ground.
Existing

Delhi-on-Demand Visual
Design Elements
TRIAL SITE 3: This feature occurs on crossroads of different streets and thus are placed such that it atleast occurs every 500m before hitting a high speed route. Its central location is integral for it to function as programme of the system and the activities that can take place have a large catchment area.

TRIAL SITE 2: One can notice these elements added centrally to JJ clusters and dense illegal post-partition colonies. Giving these communities which are strongly bonded in themselves an urban space to interact and support their informal economic ventures.

TRIAL SITE 1: Similarly the site that depicts speed of the system has also been engaged in balancing basic urban commons throughout the district as everyone needs street food.

DYNAMIC PLAZA (Still Route):

Design Element type: CULTURAL AND INFORMAL ECONOMY

The plaza as a physical form stays permanent but the activities on it changes to suite the resident as well vendors and hawker. A meter specifically alone administers the demand. One can procure economic feature of their electronic card to demand commerce space for a day. Similarly one can demand for a open space for cultural function like satsangs. On another hand protest can be made on this plaza. If their is demand for a particular activity from a certain plaza one can arrange it seeing the capacity of the plaza and fulfilling 50% occupancy of it.

These plaza occur and the confluence of different types of route and can attract a large audience.
Existing

Delhi-on-Demand Visual
Design Elements
TRIAL SITE 3: JJ Clusters are absent thus as a design feature have not been added but the residents together can request for this addition when the phasing is done for the site.

TRIAL SITE 2: The JJ clusters are the only one which have the benefit of added functions that further their social, cultural and economic based activities.

TRIAL SITE 1: JJ Clusters are absent thus as a design feature have not been added but the residents together can request for this addition when the phasing is done for the site.

PLATFORM (Still Route):

Design Element type: CULTURAL AND INFORMAL ECONOMY

The platforms are smaller versions of plaza but are also dynamic physically. If there is demand for a particular activity from a certain plaza one can arrange it seeing the capacity of the plaza and fulfilling 50% occupancy of it. They use the boards of dynamic walkway but are placed on either side of the street to occupy the complete street, creating a platform in the middle of the street as a demarcation.

These platforms have been provided in JJ clusters due to lack of personal space within homes to carry out informal activity based economic growth which are key occurrence in an informal settlements, which lack common places especially delineated for urban common based functions.
TRIAL SITE 3: JJ Clusters are absent thus as a design feature have not been added but the residents together can request for this addition when the phasing is done for the site.

TRIAL SITE 2: The JJ clusters are the only one which have the benefit of this added function as this housing typology is associated with severe lack of sanitation services.

TRIAL SITE 1: JJ Clusters are absent thus as a design feature have not been added but the residents together can request for this addition when the phasing is done for the site.

TOILET (Still Route):

Design Element type: SERVICES

These toilet boxes have been provided in JJ clusters these housing typology being identified by poor sanitation based services. Its a permanent feature and can be used by any one in the line to it.
SERVICES

- Permanent
- Dynamic

District Gate:
- Community
- Bus only
- Tree

Neighbourhood Gate:
- Guard
- Plaza with dynamic activities
- Platform on streets converted to still route
- Public playground on street converted to still route
- Toilet Box on routes converted to still route
- Seating on the streets converted to still routes
- Footpath
- Dynamic Walkway
- Demand Stops and stations

LIGHTING

- Design Element type: SERVICES
  - Each physical design feature comes with integrated lights. The lighting works if the street is in demand and the daylight has diminished, both information can be fed by the system depending on daily weather report and demand data of the street. Thus making it an intelligent, optimum usage of resource.

  - The lights also consider if it is dark and if a female has demanded for walking a particular route, where the demand data priority is not required as the walkway or dynamic features which only activate their light and not get physically changed.
WHY THIS SITE?

This trial site serves the purpose of exhibiting how a neighbourhood interacts with the city speed route and what happens at the junction of when different types of speed routes meet.

It also demonstrates how one’s life changes due to the system in respect to a working mother and her child as demonstrated further.

STRATEGY DEVELOPMENT

The strategy used to select and design routes are speed and walking scale, the same has been applied at still scale. Using the strength of connectivity of current network understood by space syntax and how functions are laid out in the trial site one determines the still routes and urban public spaces and playgrounds. But these activities are determined by lesser strength street as still routes are not used as through road but as urban activities.
DEMAND STOP
speed routes / confluence of routes

NEIGHBOURHOOD GATE: TREE
still routes

DISTRICT GATE: BUS ONLY
district speed routes

DISTRICT GATE: BUS ONLY
district speed routes

NEIGHBOURHOOD GATE: GUARD
walking routes

DYNAMIC WALKWAY
walking routes

SCHOOL AND WALKWAY
walking routes

TRIAL SITE 1: DESIGN ELEMENTS
ENGAGING THE DESIGN ELEMENTS

SEATING
still routes

DISTRICT GATE: BUS ONLY
district speed routes

CITY GATE
speed route

CITY GATE
speed route

TRAFFIC BOLLARDS
speed routes

DEMAND STOP
speed routes / confluence of routes

CITY GATE
speed route

Trial Site Design
A case scenario of the life of a resident living in this trial site.

**To and From Work**

- **Walking Route**
- **Bus Lane**
- **Footpath**
- **Dynamic Walkway**
- **Traffic Bollards**
- **City and District Gate**
- **Guard Gate**
- **Tree Gate**
- **Demand Stop**
- **Public Playground**
- **Dynamic Plaza**
- **Seating**
- **Meter**

**500M Ø**

**Trial Site Design**

**Session Site 1: Design Layers**

- **Housing and Function**
- **System’s Route Selected**
- **Permanent Design Elements**
- **Dynamic Elements**

**Example Route IN THE Life of a Resident**
A example route in the life of a resident:

1. Walking through the still route
2. Dropping your child to the school
3. Catching a bus near your home at the stop you demanded
4. Getting down at the demanded stop in the district nearest to your home
5. Travelling on city speed route to and back from work
6. Shop at the gate to walk inwards
7. Demanding dynamic walkway
8. Pick you child from the playground on the still route
9. Socialize before heading home

Trial Site Design
WHY THIS SITE?

This trial site serves the purpose of exhibiting how a neighbourhood interacts with the district speed route and how different housing typology can interact with the new urban system Delhi-on-Demand.

It also demonstrates how one’s life changes due to the system in respect to slum dweller and his increase in accessibility to the city, functions within the neighbourhood and services that he can enjoy through the system.

The strategy used to select and design routes are speed and walking scale, the same has been applied at still scale. Using the strength of connectivity of current network understood by space syntax and how functions are laid out in the trial site one determines the still routes and urban public spaces and playgrounds. But these activities are determined by lesser strength street as still routes are not used as through road but as urban activities.
ENGLISH

TRIAL SITE 2: DESIGN ELEMENTS

ENGAGING THE DESIGN ELEMENTS

SEATING
still routes

SHOPPING ON WALKWAYS
walking routes

TOILET BOX
still routes

DISTRICT GATE: COMMUNITY
district speed routes

NEIGHBOURHOOD GATE: TREE
still routes

DISTRICT GATE: BUS ONLY
District speed routes

NEIGHBOURHOOD GATE: GUARD
walking routes

DEMAND STOP
speed routes / confluence of routes

DYNAMIC WALKWAY
walking routes
A case scenario of the life of a resident living in this trial site.
1. travelling on city speed route back from work on a bus
2. crossing the community gate near your neighbourhood
3. get down at the demanded stop in the district nearest to your home
4. buy grocery at the neighbourhood’s platform
5. use the toilet in the demand system
6. or go safely to shopping
7. either relax and socialize on the still street
WHY THIS SITE?

This trial site serves the purpose of exhibiting how a neighbourhood interacts within itself using the walking and still routes that have been implemented in the urban system.

It also demonstrates how one's life changes due to the system in respect to a resident working in centre and using the walking route as a way to enjoy the new urban environment that the system provides.

The strategy used to select and design routes are speed and walking scale, the same has been applied at still scale. Using the strength of connectivity of current network understood by space syntax and how functions are laid out in the trial site one determines the still routes and urban public spaces and playgrounds. But these activities are determined by lesser strength street as still routes are not used as through road but as urban activities.
ENGAGING THE DESIGN ELEMENTS

- **Informal Economy** walking routes
- **Public Playgrounds** still routes
- **Seating** still routes
- **Neighbourhood Gate: Tree** still routes
- **Approach to Religious Places** walking routes
- **Dynamic Plaza** confluences of routes
- **Dynamic Walkway** walking routes
- **Neighbourhood Gate: Guard** walking routes

Trial Site Design
TRIAL SITE 3: DESIGN LAYERS

HOUSING AND FUNCTION

SYSTEM'S ROUTE SELECTED

DYNAMIC ELEMENTS

PERMANENT DESIGN ELEMENTS

A EXAPMLE ROUTE IN THE LIFE OF A RESIDENT

A case scenario of the life of a resident living in this trial site

Returning From Work

500M Ø

HOUSING AND FUNCTION

A EXAPMLE ROUTE IN THE LIFE OF A RESIDENT

A case scenario of the life of a resident living in this trial site

Returning From Work

500M Ø
A EXAMPLE ROUTE IN THE LIFE OF A RESIDENT

1. travelling on city speed route back from work on a bus

2. taking the district speed route from city speed route to reach the demanded stop

3. walking through the street leading to the mosque, hearing the evening prayer

4. choosing a quieter still route to walk

5. walking through residential street

shopping or stopping at dynamic plaza
**STEP 1**

**EXPERIENCE CELL**

Creating diagonally across experience cells, of test sites one being the current side chosen ‘Shahdara’ and the other diagonally opposite is the satellite city of Gurgaon which has extreme class divide with new gated neighbourhood made on village land and marked with heavy migrant flow as labour for building this upcoming city. The trial sites are not only polar opposite but follow class divide and have bad public transport link. The diagonal is taken such that people come across the system and how the urban infrastructure changes as per demand in favour of public transport without visiting these sites triggering a intrigue or demand for the system in their neighbourhood.

**STEP 2**

**DEMAND WISE GROWTH OF THE SYSTEM**

As the demand verbally and data wise is increased the system is implemented in those neighbourhood where demand is there thus allocating resources where required and giving priority to the need instead of top-down planning order.

**STEP 3**

**DISTANCE IMPLEMENTATION**

Implementation is done in each district/ neighbourhood by accessibility range or rings, starting with city routes to still routes, thus reaching the utopia of Walk-ability.
PHASE I: Technical Introduction on Speed Scale
SYSTEM AVAILABILITY - meters at city speed routes
ROUTE TYPE: Intra city - speed routes
MAXIMUM ACCESSIBILITY RANGE to demand system: 5km
GOAL: affordable accessibility for intra city travel from one district to another especially for large lower income groups staying in the out-skirts of the city.

PHASE II: Strengthening Neighbourhood towards Public Transport
SYSTEM AVAILABILITY - meters at district speed routes
ROUTE TYPE: District speed routes
MAXIMUM ACCESSIBILITY RANGE to demand system: 2km
GOAL: accessibility to intra city travel from inner district areas.

PHASE III: Laying the ground for walking and finishing requirement of the system’s know-how and implementations for public transport.
SYSTEM AVAILABILITY - meters at neighbourhood speed routes
ROUTE TYPE: Neighbourhood speed routes
MAXIMUM ACCESSIBILITY RANGE to demand system: 1km
GOAL: Priority to public transport achieved at each scale.

PHASE IV: Walking prioritized in neighbourhoods
SYSTEM AVAILABILITY - meters at dynamic walking routes
ROUTE TYPE: Walking neighbourhood routes
MAXIMUM ACCESSIBILITY RANGE to demand system: 500m
GOAL: Priority to walk-ability to the system and within the neighbourhood.

PHASE V: Social, Cultural, Economical and service design
SYSTEM AVAILABILITY - meters at still routes at each neighbourhood
ROUTE TYPE: Still neighbourhood routes
MAXIMUM ACCESSIBILITY RANGE to demand system: 200m
GOAL: Public space and services within each neighbourhood. Also the demand system by now exist for each resident within walking distance.
### Fiscal Infrastructure

- Singapore: economic boon followed by car-usage growth similar to India but they subsequently added carrot and stick method to curtail car growth. This phase is meant for empowering the public transport on a city wide scale and hence curtailment of private vehicles are required.

- Osaka, Japan: old infrastructure with new technology. As researched and proven earlier in the report there is abundance of infrastructure resource in Delhi, which the city is lacking is adapting its use to new technology as well as for public transport which the project is aimed for.

### Building regulation

- Global south; social spatial inequalities; priority given to Education

- Providing not only accessibility but also voice to people who otherwise are not able to voice their needs and demands in the capitalist economy of cities.

- Sweden: road safety & human scale considerations: This is the phase when we get to human scale consideration and also to human scale accessibility issues and solution within the capitalist economy of cities.

- New York: extensive car-usage and public spaces. This is the phase when for vision zero policy application and converting large spaces at traffic jammed routes to public squares eg. highline and times square.

### POLICY AND TECHNICAL IMPLICATIONS

- slow reduction of current subsidies on personal usage of fossil fuels.
- promotion of electronic cards compared to paper ticketing systems, offering women given priority for public transport demand, to run the night buses effectively.
- taxation for vehicular ownership availability of encouraging the electronic card online, smart phones, local shops - Kirana and supermarkets.
- free shuttle service to speed routes for resettled slum dwellers placed in villages at the state borders.

- higher taxation for green maintenance of vehicles
- priority for buses and public transport on different routes selected and as demanded by the public
- subsidized public transport when demand grows
- fining of cars in lanes for buses or changed to bus lanes as per the demand by the system
- integration of existing metro usage with the demand system and applying same rules of demand usage as done for other modes of public transport
- monetary return on electronic card for low personal usage of petrol per user in private vehicles
- ticket subsidies for resident checking-in further away from stops and station to encourage walking and cycling.

- shops and local business encouraged fiscally at the walking routes to use the platform created by the public
- for road safety within these neighbourhoods vehicles speed limits are lowered
- congestion tax is applied for larger vehicles within these dynamic routes to control the traffic on half of the width open for traffic flow
- when walking space is demanded within the district the system doesn't charge you to convert to dynamic walkway as your right to city
- parking is allowed on these route in off peak hours.

- for road safety within these neighbourhoods motorized vehicles speed limits are lowered
- when public space is demanded within the district the system doesn't charge you to convert to dynamic walkway as your right to city
- informal but non-permanent activities are open in plaza area, such that plaza could be used for economic as well as cultural activities.
- parking is not allowed in the still routes anymore time
- still routes can be rented for schools with limited grounds on daily basis for different non-permanent activities.
Reflection

The relationship between research and design

Through research of asking why Delhi was becoming so centric to private vehicles and why and how do economically weaker groups are marginalised to the fringes of the city, I came to my design and technological solution of Delhi-on-Demand system. As the new urban system of demand based planning stem from the fact that Delhi is going through a massive unbalanced urban transformation and bases it’s planning on image-ability more than need, something I learnt from the various series of why I asked in research. The design in itself evolves how the system adapts to the current socio-economic and spatial configuration of the city and vice versa adapts the city to the demands made by the citizens. Thus answering the questions that lingers from research, how do people currently travel and how would they like to change it? How can the current structure adapt to an urban transformation of this kind to serve the demands of the people? Where should the resource of infrastructure be allocated and where is its most needed? How can walk-ability of 22 million residents of Delhi be made possible? Thus my answering these loops of questions I came to the conclusion in design phase that it develop in a way that it is by the people, for the people and from the people and therefore a logical solution for me was Delhi-on-demand system.

The relationship between the theme of the graduation lab and the subject/case study chosen

The topic of this year studio is ‘New Utopias on the Ruins of the Welfare State’. The ruins is the bi-polar city created by continuous subsidiizes provided to middle and higher income group which encourage car travel, unaffordable public transport and thereby gated communities. Through my Utopia I challenge the notion of that motorized traffic is the only way to serve the city’s growing needs and bring to light the 35% of the population that walks for whom there are no provisions provided in the network. Creating a new society where understanding the co-dependency is the key to living. I use my Utopia as a guiding goal (Immanuel Kant) for my project. Thereby coming to the design intervention and strategy through a smart technology of Delhi-on-demand system, which in itself is a Utopia to begin with and serves the demand of the people of Delhi in terms of mobility infrastructure for foot traffic and mass transit traffic and allocates resources where it is required instead of a top-down planning approach. The precipitated results was also urban design interventions in the form of social, cultural and economic (informal) at neighbourhood scale.

The relationship between the methodical line of approach of the graduation lab and the method chosen

The methodical line of approach of the graduation lab in my eyes is to question the current trends and system that is delivered by state and see if it really aids the citizens or attacks them. My approach to the project was thus as stated earlier was series of why questioning which were intrinsically to how the planning is done currently in the city, what is its political agenda behind it and whether or not these agendas match the need of the common man. Being part of Design as politics one realises that in my chosen profession of Urbanism one does need to take a political stand-point before any design or planning decision can be executed due to the scale of lives an urban intervention effects. A better understanding of politics aids one in what has to be done and how should it be presented to intended audience. Thus, in my phasing especially I have taken to account what are the current political trends in Delhi and how in every political term this large scale urban system Delhi-on-Demand can be executed in piecemeal to still reach my utopia in a course of 25 years.

The relationship between the project and the wider social context.

As an emerging market, it is important for India to consider a way of development which sustainable both economically and environmentally. This can be done when the planning is done for all sections of the society. While considering the transport links in the city it is thus important to consider lower income groups as they form the labour force to the society and thus establish a co-dependent system of all income groups. Where higher income groups are dependent of lower income groups for manual labour and lower income groups are dependent on higher income groups for intellectual labour. Thus as a soon to be an urbanist, one should not forget this dynamics that the society works on. Hence, in my design I came with a technology that changes this urban system of mobility according to people’s demand, allocating the urban resource of infrastructure where the need is instead of large scale development to make the city look just ‘beautiful’.

Scientifically this project attempts to raise the question of why are planning bodies in developing countries fail to see the context of their society and simply borrow international planning methods.

At the same time on international grounds, the project aims to raise questions of healthier society models that can be seen in urban fabrics by mixing income households, diversity, stimulating demand through walk-ability. Looking at old urban models with new light of walk-ability and trying to see the mutations to the same model on walking basis.


APPENDIX

<table>
<thead>
<tr>
<th>Budget of Delhi for 2012-17</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural development</td>
<td>0.98%</td>
</tr>
<tr>
<td>Energy</td>
<td>0.44%</td>
</tr>
<tr>
<td>Industries</td>
<td>5.36%</td>
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<tr>
<td>Secretariat economic services</td>
<td>0.22%</td>
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<tr>
<td>Civil supplies</td>
<td>0.61%</td>
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<tr>
<td>General education</td>
<td>0.01%</td>
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<tr>
<td>Education</td>
<td>11.49%</td>
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<tr>
<td>Medical</td>
<td>0.63%</td>
</tr>
<tr>
<td>Water supply &amp; sanitation</td>
<td>12.22%</td>
</tr>
<tr>
<td>Public health</td>
<td>3.00%</td>
</tr>
<tr>
<td>Urban development</td>
<td>9.67%</td>
</tr>
<tr>
<td>SC/ST/OBC/minorities</td>
<td>1.78%</td>
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<tr>
<td>Labor &amp; labor welfare</td>
<td>0.04%</td>
</tr>
<tr>
<td>Social welfare</td>
<td>1.78%</td>
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<tr>
<td>Education</td>
<td>16.14%</td>
</tr>
<tr>
<td>Secretariat economic services</td>
<td>1.39%</td>
</tr>
<tr>
<td>Transport</td>
<td>24.39%</td>
</tr>
<tr>
<td>Other administrative services</td>
<td>0.78%</td>
</tr>
<tr>
<td>Medical</td>
<td>2.15%</td>
</tr>
<tr>
<td>Urban development</td>
<td>14.97%</td>
</tr>
<tr>
<td>Housing</td>
<td>2.15%</td>
</tr>
<tr>
<td>Transport</td>
<td>24.39%</td>
</tr>
<tr>
<td>Social Welfare</td>
<td>11.88%</td>
</tr>
<tr>
<td>Education</td>
<td>16.14%</td>
</tr>
<tr>
<td>Energy</td>
<td>6.38%</td>
</tr>
<tr>
<td>Urban Development &amp; Housing</td>
<td>12.22%</td>
</tr>
<tr>
<td>Medical</td>
<td>16.14%</td>
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<tr>
<td>Other administrative services</td>
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<td>Urban development</td>
<td>14.97%</td>
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<tr>
<td>Education</td>
<td>16.14%</td>
</tr>
<tr>
<td>Transport</td>
<td>24.39%</td>
</tr>
</tbody>
</table>

For the 12th Five year plan (2012-17) 90000 crore rupees have been allotted, that is, > 11 billion Euros

Plan Outlay is the allocated amount for expenditures on plan projects, schemes and programmes approved in the Plan Source: Economic Survey of Delhi 2012-13, as per five year plan 2012-17.
LOCATION JJ CLUSTERS AND ILLEGAL COLONIES

DISTRICT WISE DENSITY OF DELHI

Source: Census of India, 2001
DELHI - ACCESS TO SANITATION

Source: Census of India, 2001

DELHI - ACCESS TO PIPED WATER

Source: CENSUS

DELHI - WATER ZONES: UNEQUAL DISTRIBUTION

Source: DJB, 2014

Source: Census of India, 2001
HEALTH

- general hospital
- clinics
- health care centre

GREEN AND RECREATIONAL

- district green
- neighbourhood playgrounds
- recreational activity
- neighbourhood green
ADMINISTRATION

- fire station
- administration body
- political party's office
- police station
- city's service plants
- post office
- police post
- district centre