sustainable urban mobility

Project Report for the
City of Indore, India

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Project Report for the city of Indore, India

As part of

Sustainable Mobility Project 2.0

(SMP2.0)

by

World Business Council for Sustainable Development

wbcsd mobility

(Jan 2016)

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Sustainable Mobility Project 2.0

Indore

Final Report 2016

1. Executive Summary

The **Sustainable Mobility Project (SMP2.0**) was established by the World Business Council for Sustainable Development (WBCSD) to build on its earlier work in this field. It brings together a global, cross-service group of 15 mobility-related companies to accelerate progress towards sustainable mobility.

The group had collectively developed the engagement process, the methodology and tools and provided inputs to specific city project teams. To evaluate its SMP2.0 process methodology, the SMP2.0 team selected six cities (Bangkok, Campinas, Chengdu, Hamburg, Indore and Lisbon) across the globe to participate in a "demonstration" of the process. For each of these cities, a subset of the SMP2.0 member companies volunteered to collaborate with the city to implement the process and to develop a sustainable mobility roadmap which could enhance the city's mobility plans. The CTF member companies associated with Indore were – **Ford Motors (lead), BMW Group, Feedback Brisa Highways (Ezeeway), Volkswagen and Fujitsu**.

Indore was invited to participate in SMP2.0 because of its commitment to sustainable mobility and to provide a balance to global group of cities in terms of mobility development and geographical presence. Also, Indore administration was highly pro-active and had been working on the mobility improvement of the City in the past. Given the increasing stress on the infrastructure because of heterogeneity of traffic, road fatalities, congestion and dominance of traditional mobility modes in Indore, city understood the need of an immediate intervention.

The typical outline process or methodology applied across 6 global cities for undertaking SMP2.0 can be divided into 5 phases and during each phase extensive stakeholder consultations are carried out. The stakeholders for Indore were - Mayor and Commissioner of IMC, Indore District Collector, CEO of IDA, CEO of AiCTSL, Deputy Superintendent of Traffic Police, officials from Town & Country Planning, MP, sector experts from city, representatives of various trade organizations in the city and citizen activists. Over the course of these activities multiple stakeholder consultation sessions were conducted to discuss the issues, identify problem areas, solutions and prioritize them.

As part of phase 1 project **kick-off** meeting was held in **July 2014**. During the Kick-off meeting, a Memorandum of Understanding was signed between AiCTSL and WBCSD. Post the kick off meeting the WBCSD team interacted with the city on a regular basis and shared details pertaining to engagement aim - objectives, initiated a dialogue with various stakeholders and tried to grasp the probable challenges. In this stage background research on the city, assessment of historical published data and growth trends were also studied. These factors were then mapped on City Cluster Analysis developed under "Mobility Cultures in Megacities[1]", and as per this research, Indore could be characterized as "Non Motorized"

[1] by Technische Universität München on behalf of Institute for Mobility Research (IFMO), 2010

cluster which was evolving into cluster titled as "Traffic Saturated".

Based on various past studies across the globe CTF team shared a list of twenty two (22) indicators under which the issues in cities can typically be categorized. Following which city stakeholders based on their understanding of the city shortlisted twenty (20) concern areas and team undertook multiple Focused Group Discussions (FGD), citizen surveys, consultations across city to highlight the key concerns of the city and called them "**priority indicators**". The 20 indicators were evaluated based on existing data / citizen surveys and mapped on a **spider chart**. Seven (7) indicators returning low sustainable mobility scores namely – **1) road safety, 2) congestions and delay, 3) travel time, 4) quality of public area, 5) intermodal connectivity, 6) access to various mobility services and 7) access to all** - were then chosen given their exigency. Addressing these indicators could substantially improve the sustainable mobility of the city.

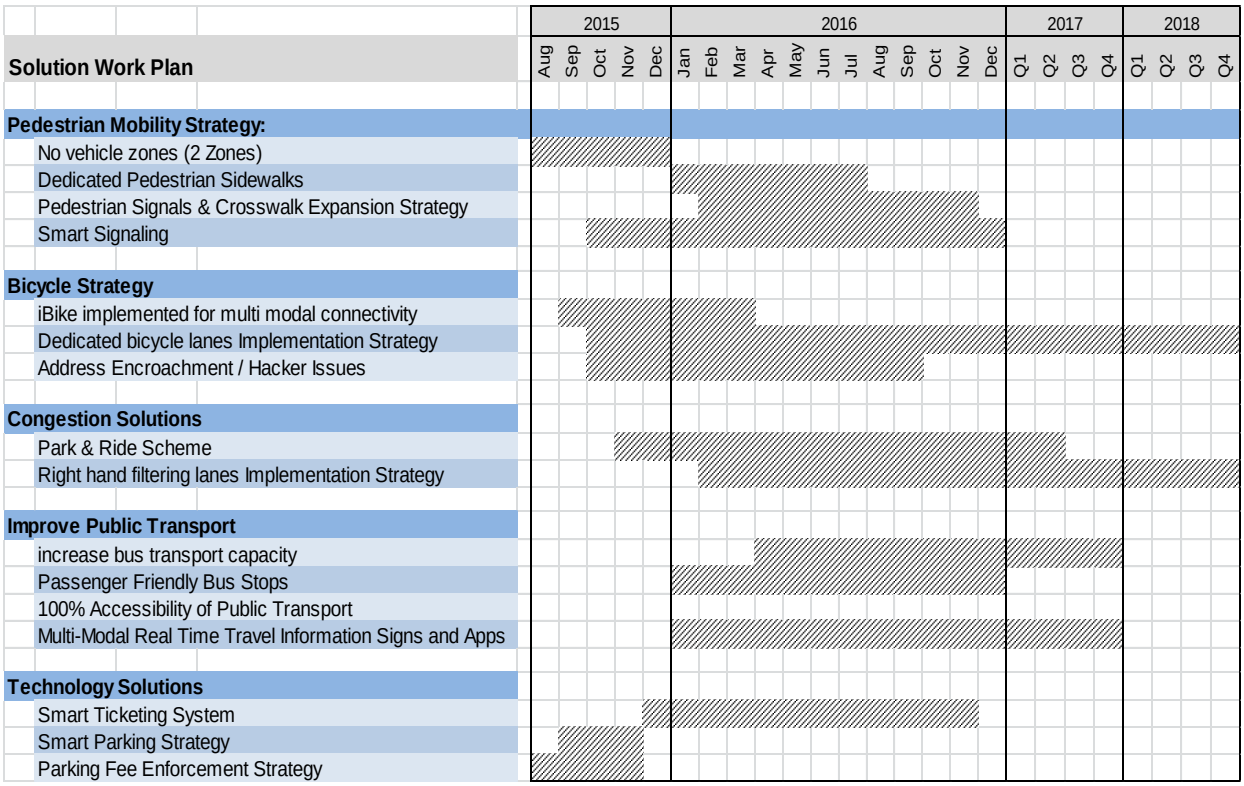
The citizen survey was undertaken with ~800 respondents across the city. The survey conducted was for identification of indicators as well as a validation of the issues which had been discussed in the citizen consultations so far. The survey also helped prioritize the indicators based on severity felt by the citizens. In July 2015, the survey results were presented to the stakeholders and a discussion on formulation of road map was undertaken. Two pilot projects (Jawahar marg, Sapna Sangeeta road) were identified in May 2015 to validate the shortlisted priority indicators.

Alongside, city stakeholders with the CTF team shortlisted 34 potential solutions from a long list of 70. And these 34 solutions were then clubbed into 5 major and 15 sub categories as shown in the table below -

Major category	Sub category
Bicycle Mobility Solutions	1. Bike Sharing 2. Dedicated Bicycle Lanes 3. Integrated Cycling with Public Transport
Pedestrian Mobility Solutions	4. Pedestrian Mobility Strategy 5. Visual Display at Pedestrian Crossings
Congestion Solutions	6. Park and Ride scheme 7. Right turn filtering lanes 8. No Vehicle Zone
Improve Public Transport	9. Passenger Friendly Bus Stops 10. On-board Bus Travel Information 11. Intermodal Travel Information / Real time Information Apps 12. Access of public transport to all
Technology Solutions	13. Parking fee enforcement strategy 14. Smart Ticketing systems 15. Smart Parking

A study of best practices for these 15 proposed solutions were shared during discussions with the stakeholders. These case studies mentioned success factors, risks associated, new ideas, ideal solutions, involvement of latest IT / communication technology available within India and also outside. Also, the idea was to identify various initiatives being planned across the country as part of smart city project and to observe if the learning's can be applied in Indore.

In Oct 2015 a road map was formulated and shared with the stakeholders for a final buy-in. During the same time an exercise was undertaken to identify barriers and enablers (behavior, policy, finance and infrastructure) for each solution recommended in the roadmap.



A monitoring committee was set up under the Chairmanship of Indore District Collector to develop detailed reports/plan, implementation mechanisms and track timelines of each recommendation suggested under the Roadmap.

Lastly, the Roadmap is an evolving document that can be further adapted to the new technological advancements and learning's as the city continues its path towards improved sustainable mobility.

2. About the Project

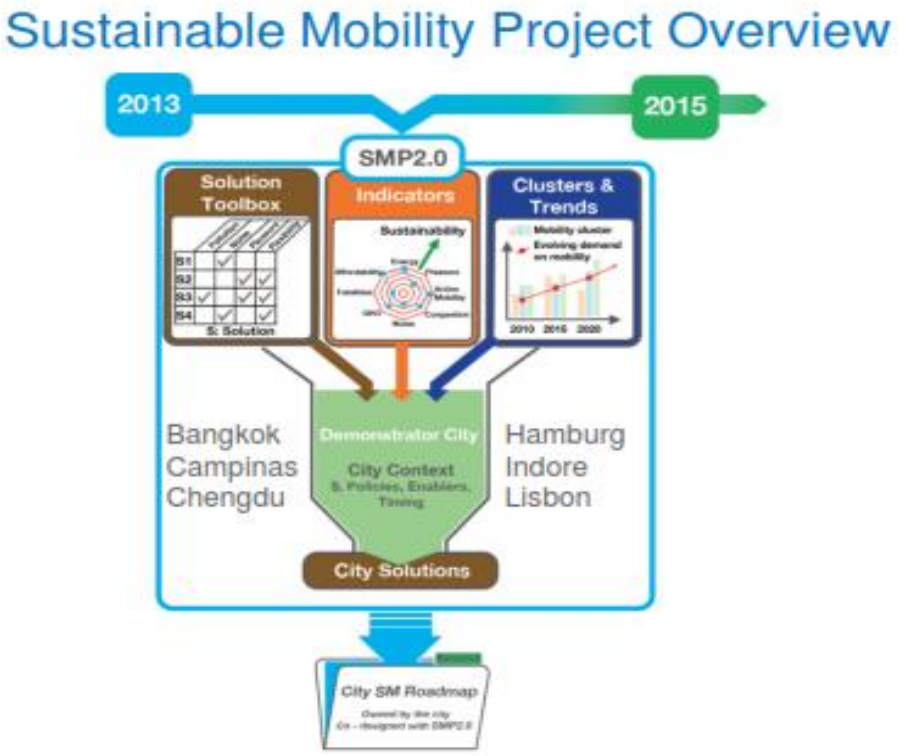
2.1 SMP2.0 & Objectives

The Sustainable Mobility Project (SMP2.0) was established by the World Business Council for Sustainable Development (WBCSD) to build on its earlier work in this field. It brings together a global, cross-service group of 15 mobility-related companies to accelerate progress towards sustainable mobility.

The ultimate objectives of the study is to -

- Accelerate and extend access to safe, reliable and comfortable mobility for all,
- Aiming for affordability,
- Higher road safety,
- Low environmental impacts, and
- Reduced demands on energy and time.

The group has collectively developed the engagement process, the methodology and tools and provides input to specific city project teams. To evaluate its SMP2.0 process methodology, the SMP2.0 team selected six cities across the globe to participate in a "demonstration" of the process. For each of the six cities, a subset of the SMP2.0 member companies volunteered to collaborate with the city to implement the process and to develop a sustainable mobility roadmap which could enhance the city's mobility plans.



The Indore project team henceforth referred to as "City Task Force (CTF)" consists of **Ford Motor Company** (the lead company for the Indore SMP 2.0), **BMW, Feedback Brisa** (Indian subsidiary of Brisa, a Portuguese company), **Fujitsu** and **Volkswagen** working together with the city of Indore (Refer annexure 9.2 for more details)

2.2 About WBCSD

The World Business Council for Sustainable Development (WBCSD) is an independent organization of forward-thinking companies that galvanizes the global business community to create a sustainable future for business, society and the environment. The WBCSD's Global Network is an alliance of nearly 200 business organizations united by a shared commitment to providing business leadership for sustainable development in their respective countries or regions.

The WBCSD was founded in 1992 post Rio Earth Summit to ensure the business voice was heard at the forum and its likes in future. It was created by Swiss entrepreneur and philanthropist Stephan Schmidheiny who believed that business had an inescapable role to play in sustainable development - at the same time as making significant contributions to the creation of a sustainable society, is in the interest of business.

Together with its members, the council applies its thought leadership and effective advocacy to generate constructive solutions and take shared action across sectors like Transportation, Urban Infrastructure, Energy, Food, Forest, Technology etc.

2.3 Why Indore

The project was keen to select not just cities that filled the hard criteria of the cluster and geographic locations but also cities that had demonstrated a commitment to move towards sustainable mobility. Following meetings with the various city officials it was apparent that Indore had not only started to move in this direction but also was keen to establish the necessary structures and put in the required efforts to make quick progress in adopting new ideas. The SPV that already existed in the form of AICSTL proved to be a perfect vehicle for the engagement as it brought together all the different departments and players on its board.

Indore was invited to participate in SMP2.0 because of its commitment to sustainable mobility and to provide a balanced global group of cities in terms of mobility development and global geographic location.

Indore administration is highly pro-active and has been working on the mobility improvement of the City for some time now. The city understands need of an immediate intervention given the increasing demand for managing fast growing issues of heterogeneity of traffic, road fatalities, congestion and dominance of traditional mobility modes in Indore. Over the past 10 - 15 years, city has been witnessing a burst of growth in terms of –

- Economic / industrial development in and around the region,
- Migration from adjoining areas/ creation of satellite towns,
- Disposable income

Keeping all this in mind, there was an instantaneous want to improve the existing urban mobility solutions, bring in efficiency, technological interventions and ensuring that the new proposed solutions cater to the concerns of the city and are sustainable.

2.4 City's Stakeholders

Several of the city's senior decision makers including -

- Mayor and Commissioner of IMC
- District Collector[2]
- Chief Executive Officer (CEO) of IDA
- Chief Executive Officer (CEO) of Atal Indore city Transport Services Limited[3] (AiCTSL),
- Deputy Superintendent of Traffic Police,
- Officials from Town & Country Planning, MP
- Sector experts from city
- Representatives of various trade organizations in the city
- Citizen activists

participated in the WBCSD SMP2.0 project. Over and above the local team, representatives from WBCSD member companies and international sector experts (also known as the CTF team) were part of the engagement process. Meetings for the engagement took place approximately every quarter with all the stakeholders and more frequently with smaller audience on a case to case basis.

2.5 Limitations of the Study

As is appropriate in these situations, it is important to note the limitations of the data upon which the analysis was based. A limitation to the present study was lack of recent published data. These limitations have been detailed below -

- *Lack of latest research studies* – the study is based on old surveys and research reports on the city like Census of India (2011), Comprehensive Mobility Plan for Indore Urban Area (2010), Traffic Flow Study for Indore City (1997), Comprehensive Traffic and Transport study (CTTS) for Indore Urban Area (2004), Indore BRTS (2007), Traffic and Travel Pattern in Indore City (2008), ITS Solutions, Transit Signal Priority and Automated Fare Collection System (2008)

At the same time we would urge to the reader to understand, that the analysis can easily be updated as new surveys are conducted and new data is collected.

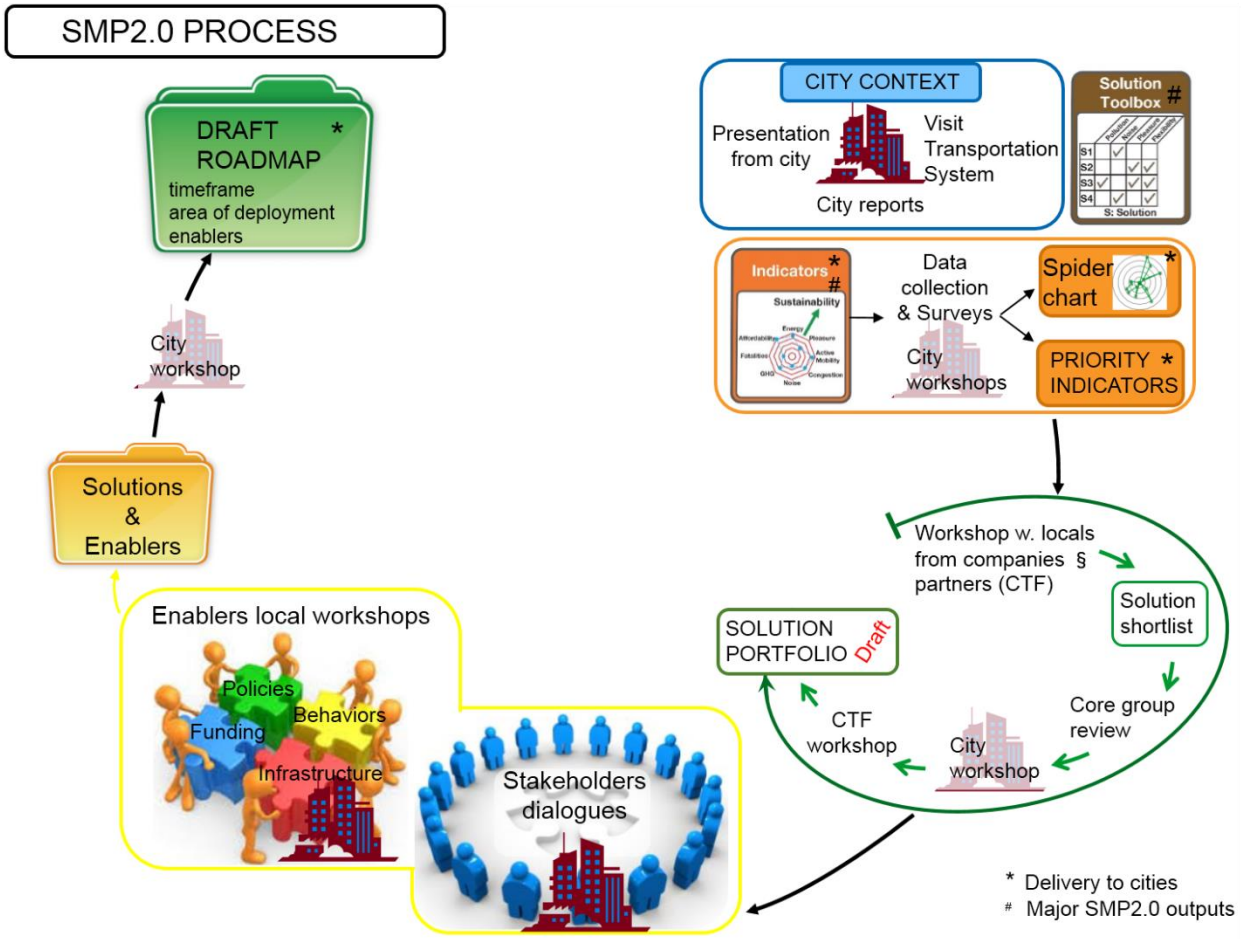
WBCSD and the city of Indore are proud of the Sustainable Mobility Project and its demonstration in Indore and are excited to see the positive changes in sustainable mobility that will result from its recommendations.

[2] Chief Administrative and Revenue officer of the city

[3] Special purpose company responsible for urban transport and it comprises of all the relevant government and city administration bodies affecting the mobility of this city

3. Engagement Methodology

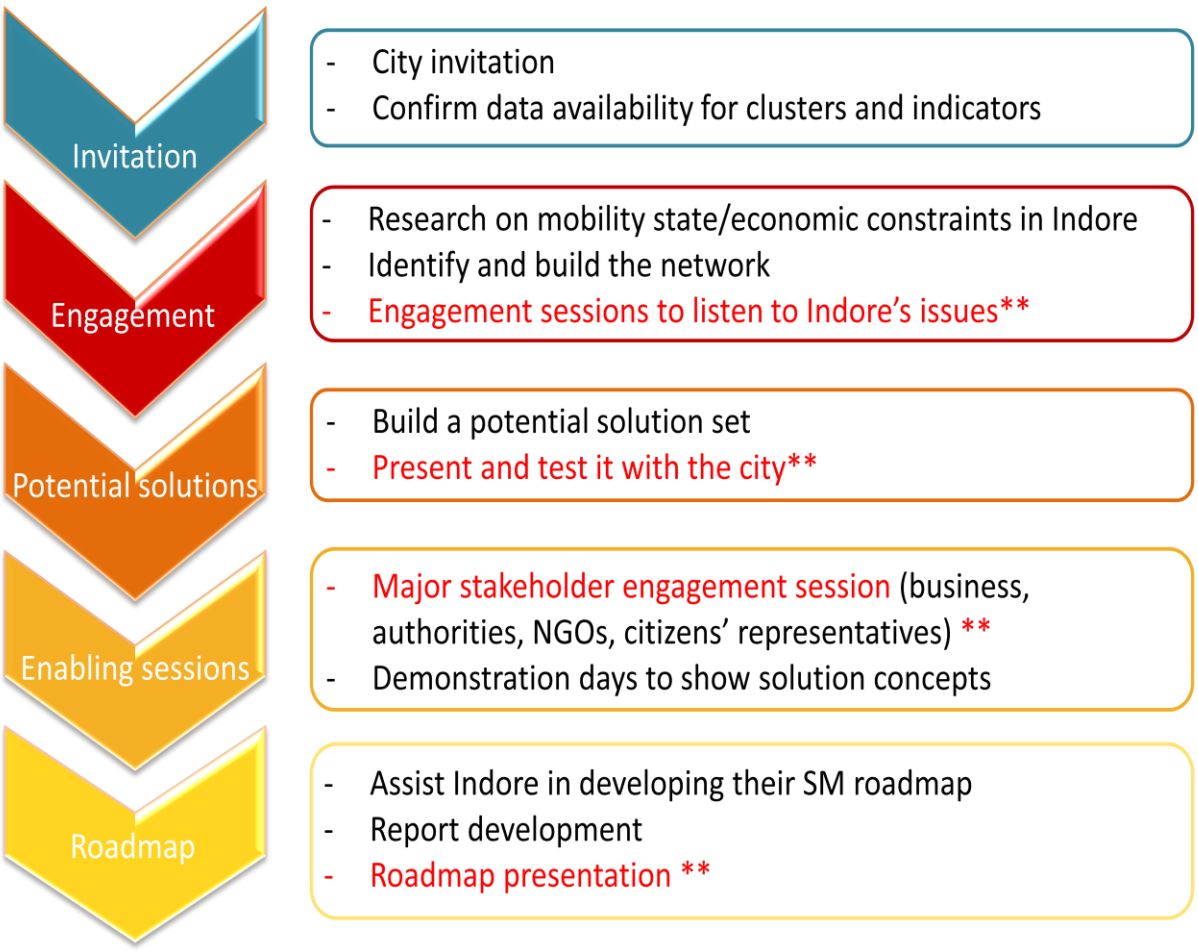
As the citizen, officials and other stakeholders in the city are the people with best knowledge of the city function and requirement, the engagement was envisaged to garner stakeholder response and opinion about the concerns in the city and potential solutions.



The typical outline process or methodology applied across 6 global cities for undertaking SMP2.0 can be divided into 5 phases and is shown in the flow chart below. The process initiates with inviting shortlisted cities to be a part of the initiative and as part of their confirmation checking the data available at the depth of the data. Then during the engagement research on city's economic and mobility habits, patterns is undertaken to understand the potential solutions.

At each step of the engagement stakeholder discussion sessions are planned to take "on board" inputs from various stakeholders. Then potential solution sets for each city is developed is the next stage which is then tested as pilot projects. The team then goes back to the drawing board with stakeholders jointly to understand the nuances of the pilot projects and improvise the approach if needed. Lastly, then

the city stakeholders with support of the CTF team prepare a roadmap for the city.



The entire exercise is always planned to be carried out through extensive engagement with stakeholders including businesses, authorities, Non-Government Organizations and citizens' representatives. The various activities undertaken at each stage of the flow chart above has been captured in the chart below -

Background research	• Research the current mobility state and economic constrains of the city • Clarify city objectives, challenges and the SMP2.0 process • Identify & build network of relevant city officials & stakeholder
Identification and mapping the priority indicators	• Explain city objectives, challenges and SMP2.0 process • Develop indicator calculations using the sustainable mobility indicator set that SMP2.0 has created • Undertaking citiy level survey to validate the issues
Shortlisting "priority indicators"	• Identify relevant indicators for Indore called the "Priority set"
Finalize potential solutions	• Identify potential solutions among SMP2.0 collection of best practices including technology interventions most suited for City's priority indicators
Develop roadmap	• Develop a road map with activity list, timelines and responsibility allocation • Consider barriers and enablers like behavior, finance, policy and infrastructure

- Stage 1 a background research on Indore was undertaken by the WBCSD team to develop an understanding of city features like demographics, socio economic conditions, transportation modes and citizen behavior/preferences. As part of this stage, the team also went around meeting relevant officials and initiating a dialogue to start the engagement.
- In Stage 2 of the engagement identification of mobility indicators based on the sustainable mobility indicator set developed by WBCSD team was undertaken. A citizen opinion survey was carried out to validate these indicators.
- In Stage 3 this indicator list and survey results were shared with the stakeholders to further refine/ shortlist/ approve and arrive on a priority indicator list.
- In Stage 4 WBCSD and city stakeholders together finalized the list of solutions which should be implemented in the city on priority. These priority solutions were shortlisted with the help of toolbox created by the CTF team (Refer annexure 9.3 for illustration). Best case examples from India were shared with the stakeholders to assist in understanding the solutions and ease of implementation.
- And in the last stage the stakeholders with help of WBCSD team finalized the timelines for execution of the priority solutions along with assigning of responsibility to relevant departments and discussing the potential enablers and barriers for each solution.

At each stage extensive stakeholder consultation was undertaken. WBCSD team along with representatives of its member companies were providing handholding and facilitation support. The detailed project planning, execution, regulatory interventions, monitoring, funding pertaining to each recommended priority solution would have to be undertaken by city and respective departments.

The SMP2.0 process consists of several stages involving frequent interactions with the city representatives over the **several months** which have been elaborated below –

The initial project **kick-off was held on 24 July 2014**. During the Kick-off meeting, a Memorandum of Understanding was signed between AiCTSL and WBCSD. Mayor of Indore, Mr. Krishna Murari Moghe, presided over the function and delivered the chief guest address. The Mayor in his speech mentioned, "*WBCSD along with its members have come at a very opportune time to help the city of Indore by providing optimum and workable solutions in the area of transportation. It will play a major role in easing the traffic congestion in the city*"

July 2014 - Kick off Meeting

Research the current mobility state and economic constraints in the City

Identify and build the network of relevant city officials and stakeholders

Sep 2014

CTF members utilized priority indicators to derive the potential solution set from the toolbox

Shortlisting of 70 potential solutions to 34

Nov 2014

Steering Committee confirmed the priority indicators

Selection of 17 priority solutions from the 35 potential solutions

Jan 2015

Identify potential solutions among the SMP2.0 collection of best practices and technological solutions, targeting City's priority indicators.

Feb 2015

Initial Stakeholder Dialogue was held to review the first application of the parking pilot Jawahar Marg

April 2015

Parking Pilots at Jawahar Marg and Sapna Sangeeta and Stakeholder Dialogues

May 2015

Conducted citizen survey to identify priority indicators (798 respondents)

July 2015

Presentation of survey results

Developing a road map with citizen consultation

Address policy and behavior change issues through a FGD

Oct 2015

Presentation of Roadmap, initial project report and plan

Nov 2015

Consider barriers and enablers like behavior, finance, policy and infrastructure

Jan 2016

Report hand over ceremony

During the kick off meeting a Steering Committee made of various departmental heads was formed to provide overall governance for this engagement:

- **Chair**: The District Collector, Indore
- **Co-Chair**: WBCSD
- **Members**:
  - Representative from Madhya Pradesh State Urban Administration & Development Department (MP UADD);
  - Collector, Indore
  - Commissioner, Indore Municipal Corporation;
  - CEO, Indore Development Authority;
  - CEO, AiCTSL;
  - Additional Superintendent of Police (Traffic);
  - Regional Transport Officer;
  - Joint Director, Town & Country Planning;
  - Academia and University representatives from:
    - Indian Institute of Science (IISc), Bangalore
    - Shri Govindram Seksaria Institute of Technology and Science (SGSITS), Indore

Post the kick off meeting the WBCSD team had been interacting with the city in a continuous manner to share the engagement objectives, initiate a dialogue with various stakeholders and understand the challenges. As shown in the timeline above during the month of Sep 2014, CTF team shortlisted the potential solutions from a long list of 70 to 34. Over the course of these activities multiple stakeholder consultation sessions were conducted to discuss the issues, identify problem areas, solutions and prioritize them. (refer annexure 9.9 for list of attendee of all stakeholder consultation sessions)

In Jan 2015, a study of best practices for various initiatives / solutions being proposed as part of the engagement was undertaken along with discussions on involvement of latest IT / communication technology available. The idea was also to identify various initiatives being planned across the country as part of smart city project and to observe if the learning's can be applied in Indore.

In April 2015 two pilot projects were conducted and in the month of May 2015, the citizen survey undertaken with ~800 respondents across the city. The survey conducted was for identification of indicators as well as a validation of the issues which had been discussed in the citizen consultations so far. The survey also helped prioritize the indicators based on severity felt by the citizens. In July 2015, the survey results were presented to the stakeholders and a discussion on formulation of road map was undertaken.

In Oct 2015 a road map was formulated and shared with the stakeholders for a final buy-in. Almost during the same time an exercise was undertaken to identify barriers and enablers for the activities as part of the road map.

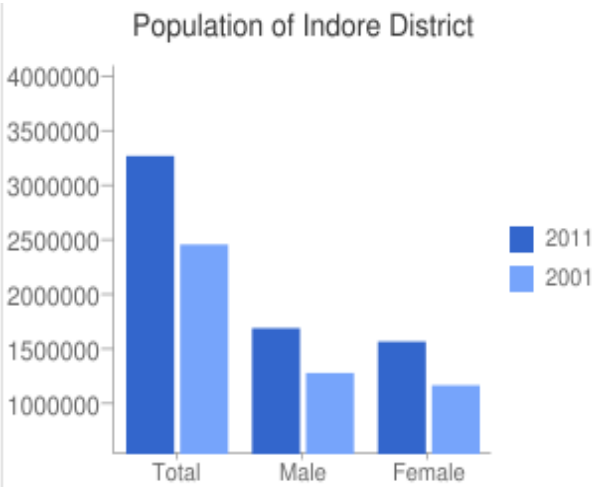
4. Overview of the city

4.1 City Demographics

Indore, a historical city situated on the banks of the rivers Khan and Saraswati, is the largest city of 'Indore Agro Industrial Region' of the State of Madhya Pradesh. It is the nerve center of the economic, social, education, medical and industrial hub of the State. It is also an important tourist destination with number of tourist attractions in and around Indore within 100 km radius.

In 2011, Indore district with a population of 3.2 million[4] constituted 4.51% of total Madhya Pradesh population. The population of Indore district in 2001 was at 4% of Madhya Pradesh (state) population. Also, the district has witnessed a population growth of 32.88% over the population of 2001 (2.4 mn which had grown at 34.30% since 1991). Thus, we can conclude that, the growth rate of inherent population of Indore district over years has reduced, however, the population contribution of district to state has been increasing – this could be owing to high in-migration from the neighboring areas.

The total urbanized area of Indore is spread over 272 sq km, divided into 85 wards and a population density of 841 people per sq km. Of the total population of Indore district around 75% of the population resides in urban Indore *(Indore agglomeration 2.2 mn and Indore Municipal Corporation areas has 1.96 mn people residing in it)* – resulting in high urbanization levels and increasing stress on the city's physical infrastructure.



Further, this urban population of 2.2 mn is projected to become 2.78 mn by 2021.

[4] Census of India, 2011 (http://www.census2011.co.in/census/district/306-indore.html)

4.2 Socio Economic Snapshot

The economy of Indore is notable for its importance in the areas of trading, finance and distribution in MP. Indore has the largest economy in central India and is the business and trading capital of the state. Located at the crossroads of western and central India, Indore has relatively good connectivity and has been the hub of trade and commerce, not only for the state but also for western India. The once famous textile industries are being overtaken by manufacturing units, BSFI services and tourism.

With a work force participation rate (WFPR) of 30% in 2001, Indore economy is expanding in all directions and it includes both the traditional agro industries and modern corporate and IT companies. Indore's growth was contributed by large automobile manufacturing units like Honda, Bajaj, Eicher, Emkay, etc setting up base in Pithampura Industrial Estate along with large IT firms like IBM, CSC, TCS, Infosys and education institutes like IITs and Indian Institute of Management (IIM) setting up centres.

The district has around 9 large multi products SEZ of ~1400 hectare[5], being developed around it along with 7 industrial areas (Sanwer, Pologround, Laxminagar, Rau, Bhagirathpura, Shivajinagar, Hatod) spread over ~ 580 hectare land, being developed by the government.

> Over the years, the city has developed multifold as crisply described by CEO of Flexituff International Limited, and Director of Indore Management Association **"**The gleaming shopping malls, swanky five star hotels, towering skyscrapers, multiplexes, and a modern airport though good indicators of Indore's economic progress, are by no means a reflection of the spirit of a city in transition"

4.3 Administrative Setup

Indore division is an administrative geographical unit of Madhya Pradesh state of India. Indore is the administrative headquarters of the division. Indore district consists of 4 Tehsils namely Depalpur, Sanwer, Indore and Mhow. There are total 335 Panchayats and 649 villages in the district clubbed under a bigger administrative unit called "blocks". There are 5 blocks in the district.

Indore is administered by the Indore Municipal Corporation (IMC) which was established in 1956 under the Madhya Pradesh Nagar Palika Nigam Adhiniyam. For administrative purposes, the city is divided into 69 wards. These wards have been further divided into 11 zones. Indore is a Loksabha constituency and has 9 assembly seats. Indore is the administrative centre and chief city of the district. Mhow is an important cantonment town in Indore District[6]

The main institution involved in planning and development in Indore district (other than the area under Municipal Corporation) is Indore Development Authority (IDA). The principal responsibility of IDA is to ensure a holistic development of the Indore agglomeration covering an area of 19.8 sq km as per Master plans. IDA plans the infrastructure like roads, water pipelines, sewerage and sanitation network in the outskirts of the municipal

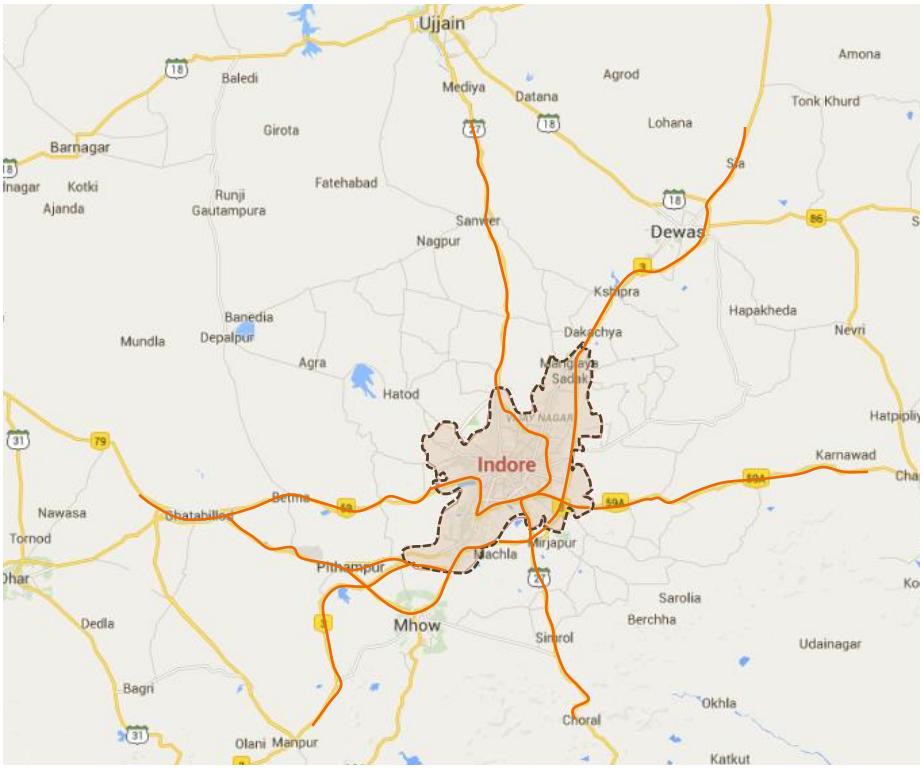
[5] MP Trade & Facilitation Corporation Ltd (TRIFAC)

[6] http://dcmsme.gov.in/dips/frorma%20-%20dips%20-%20Indore.pdf

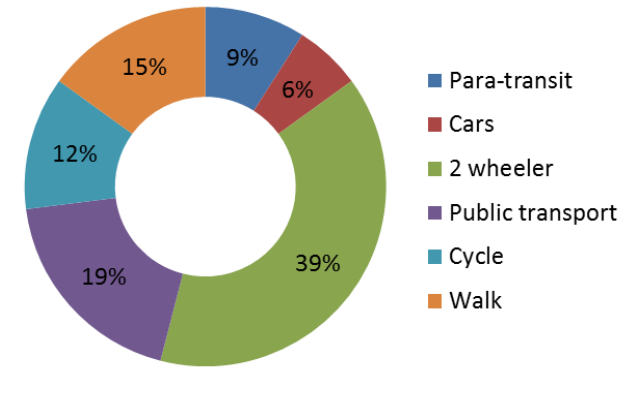
corporation jurisdiction, develops it and then hands it over to the respective authority for further action.

4.4 Mobility Snapshot

As shown in the map below[7] two (2) National Highways and one (1) state highway passes through the city which have over time developed as the major arterial roads along which the city has developed. These roads connect the city to other major cities in the vicinity like Ujjain, Mhow, Dewas, etc. City's growth corridor initially was towards South along NH-3 towards the Pitampura industrial belt. Then the corridor between Ujjain and Indore was planned to be developed as a high speed corridor and the city began growing towards North direction.



As per the comprehensive mobility report the around 12% landuse of the city is under roads and 60% of the total road length is paved roads. The urban planning guidelines suggest 10% - 15% of the total area should be utilized for roads and Indore so far with 0.9 metre per capita road length is within that limit.



With the increasing geographical spread of the city and increasing prosperity the vehicle ownership in the city has been increasing steadily. As per a historical data analysis the number of registered vehicles in the city has grown at an

[7] Source: Google map

average rate of 9.64% per year[8]. If the trend continued as per this statistics the 0.67 mn registered vehicles in 2004 should have increased to 1.3 mn in 2011.

As per the graph shown below, even though the vehicle ownership in the city is on an increase, for every 10 trip made by the people either for work or pleasure 4 trips are made by 2 wheelers, 2 trips by public transportation, 1.5 by walking, 1 by cycle, and less than 1 each by auto rickshaw/ pedal rickshaw/ cars.

In other words 15% of any travel is completed by walking[9] and 12% of the travel is completed by bicycle which compared to most metropolitan cities in India is lower incase of walking but higher for cycling (all india avg is 13%[10]). However, the disheartening statistics is, that though most trips in the city are completed by cycling/walking only 18% of the roads have a divider, 10% have a service lane and barely 6% roads have a footpath. There is an imperative need to make roads safer for pedestrians and cyclists.

Further, of the remaining 73% motorized transportation in the city car contributes only 6% to the overall and majority share of 39% contributed by 2 wheelers. In other cities like Delhi car contributes 10% but bikes are as low as 9%. Chennai with 23% 2-wheeler is the highest and all India average of bikes is barely at 12%. This suggests that the high number of 2 wheelers in Indore is phenomenally high. This has resulted in higher road accidents because of unruly driving and frequent instances of breaking traffic rules.

CITYWISE

Distance	NCT of Delhi	Bangalore	Chennai	Kolkata	Mumbai
0-1	15.9%	16.0%	13.0%	19.4%	16.3%
2-5	24.3%	22.6%	24.8%	20.4%	18.9%
6-10	18.2%	20.6%	22.1%	18.2%	17.6%
11-20	14.9%	12.8%	10.8%	6.0%	12.1%
21-30	6.3%	4.8%	3.8%	2.2%	6.1%
31-50	3.0%	2.6%	1.8%	1.0%	3.9%
51-plus	0.8%	1.1%	0.8%	0.6%	1.1%
Not stated	0.7%	1.6%	2.9%	3.3%	3.7%
Do not travel	15.8%	18.0%	19.9%	28.9%	19.2%

EXPECTEDLY

Mumbai has the biggest share of train travellers, Delhi of those who use cars. Across cities, the largest percentage walks to work

Mode	NCT of Delhi	Bangalore	Chennai	Kolkata	Mumbai	All India
Walk	22.1%	24.0%	16.0%	27.4%	25%	22.6%
Cycle	9.0%	4.3%	1.0%	7.0%	1.2%	13.1%
Bike	14.0%	17.6%	22.9%	3.8%	4.5%	12.7%
Car	10.8%	8.1%	6.1%	3.8%	4.8%	2.7%
Bus	22%	23.7%	19.4%	22%	16.4%	11.4%
Taxi/Rickshaw	2.3%	2.7%	2.1%	2.9%	3.1%	3.0%
Train	2.5%	0.9%	3.0%	3.4%	24.8%	3.5%

Graphic: Mithun Chakraborty

The share of public transport like city bus, auto rickshaw, local trains, BRTS as a potential mode of transportation at 19% in Indore is still very low as compared to cities like Delhi (Bus alone is 22%), Mumbai (Train 25% and Rickshaw 31%), Bangalore (Bus 24%) etc. One of the main reasons for this is that the average distance travelled by an individual in the city is not very high.

[8] Comprehensive mobility plan of Indore urban area, 2010
[9] Mobility Clusters in Megacities; Institute for Mobility Research (IFMO), 2010
[10] Based on Census of India 2011 and as published in Indian Express Delhi edition of 19 Jan 2016 (http://epaper.indianexpress.com/696873/Indian-Express/19-January-2016#page/13)

Experts advocate that with the change in city's socio economic profile, increasing geographical spread and stressed infrastructure because of high in-migration the city would need to be geared up timely and sufficiently to manage these changes efficiently.

In Dec 2005, Indore City Transport Services Ltd. (ICTSL) was set up to operate and manage the public transport system in Indore with private sector participation. In 2007-08, 104 buses were being operated by ICTSL, carrying approx. 1 lakh passengers. In addition to existing bus system, extensive network of BRT System was proposed for the City. Out of eight BRT corridors that were identified for Indore, five were approved for implementation. AB road BRTS pilot project is currently operational in the city and being managed by Atal Indore City Transport Services Ltd (AICTSL)[11]

AICTSL identified 18 high travel demand routes and started operation with 37 ultra-modern low floor buses. Till 2009, there were 6 private operators running the bus service in contract with AICTSL. During 2009-10, 110 buses on 24 major routes were being operated by AICTSL on a network length of 277 km, carrying over 1-1.2 lakh passengers daily. AICTSL has already received a sanction of 175 buses from JNNURM out of which 125 are semi low floor (CNG buses) and 50 are Semi Low Floor AC buses for BRTS.

Existing Intermediate Public Transport (IPT) System in the city comprises of 500 private minibuses plying on 63 routes (as per joint committee report) and 13,800 auto rickshaws[12]. In addition, 300 Tata Magic, 350-550 Maruti Vans, 100 metro taxis[13], 100 star cab are also plying as IPT.

Indore is developing a comprehensive mobility plan to meet the needs of the city in 2021. Among other aspects, it envisages an integrated, multi-modal public transport system which would be fast moving, comfortable, safe, user-friendly and reliable, with integrated land-use, equitable allocation of road space between different transport modes and compliance with safety laws.

This increasing intensity of traffic has resulted in the manifestation of a number of problems which pose a potential threat to the economic vitality and productive efficiency of the city. Traffic congestion is already severe on many road sections and lack of well planned parking lots is aggravating the issue.

The SMP2.0 demonstration phase was intended to include six cities from across the globe and that also represented a variety of sustainable mobility development phases. The SMP2.0 team referred to the City Cluster analysis "Mobility cultures in megacities", which was developed by Technische Universität München on behalf of Institute for Mobility Research (IFMO), 2010. (Refer annexure 9.4 for further details about the global representation and cluster representation of the six cities). As per this analysis cities across the globe based on its population, GDP, land area, modal split, and mobility construct can be categorized into various clusters. As per this, Indore is characterized as "Non Motorized" and evolving into cluster titled as "Traffic Saturated"

[11] ICTSL was renamed as AICTSL
[12] RTO (2009 – 10) report
[13] AICTSL

Non Motorized:

Mobility: Infrastructure struggling to keep up with demand / density of city even with large investments; Concerning increase in vehicle ownership, resulting in municipal and citizen demand for improved options; Urban mass transport policy leading to investment in sustainable transport, and congestion management, but systems lacks integration and sharing options.

Safety & Health: Low traffic and public safety levels

Equality: large gap of working poor

Traffic Saturated

Mobility: Vehicle traffic remains heavy due to incoming wealth, amidst a proactive and extensive public transit network; Traffic management systems and encouragement of green forms of transport is high (though not necessarily adopted); Intense congestion but congestion management is low

Safety & Health: High transport fatalities and low levels of public safety

Equality: Inequality and poverty

5. Priority Indicators

Understanding the city's objectives and evaluating its mobility system performances across the SMP2.0 sustainable mobility indicators is the essential first step, which enables the project team to identify relevant indicators, such as congestion, travel time, access to mobility services and safety.

The SMP2.0 process developed both the methodology and the tools by which a city in collaboration with business could understand and improve its sustainable mobility plan. A set of data driven indicators was developed to measure a cities sustainable mobility. These indicators are calculated using data about the city and also via a survey of its citizens. The results are then represented in a spider chart providing a quick visual cue to the areas of opportunity.

WBCSD SMP2.0 proposes a set of 22 indicators measuring the potential for sustainability of mobility in cities. The indicators have been developed within a core group of experts from different industries involved in urban mobility. The work group was backed up by Oran Consulting, working closely together with the Institute for Sustainable Mobility of Ghent University. An international and multidisciplinary Assurance Panel reviewed the reports of the indicator work stream during the process and international expert assessment meetings were organized at the Transforming Transportation Conference in Washington DC (16 January 2014) and at OECD in Paris (17 June 2014) with the participation of ITF.

5.1 Selection of Priority Indicators

A set of 22 indicators were identified to comprehensively describe sustainable mobility in cities:

1. Emissions of greenhouse gases (GHG)
2. Net public finance
3. Congestion and delays
4. Economic opportunity
5. Commuting travel time
6. Mobility space usage
7. Quality of public area
8. Access to mobility services
9. Traffic safety
10. Noise hindrance
11. Vehicle polluting emissions
12. Comfort and pleasure
13. Inclusive Access
14. Affordability of public transport for poorest group
15. Security

16. Functional diversity
17. Intermodal connectivity
18. Intermodal integration
19. Resilience for disaster and ecologic/social disruptions
20. Occupancy rate
21. Opportunity for active mobility
22. Energy efficiency

By using the indicator set, cities can identify the strengths and the weaknesses of their mobility system, including freight and passenger transport. From indicator scores the city can identify in which are improvements are most desired, by comparing score levels between parameters.

The indicators are presented as a comprehensive set which spans over four dimensions of sustainable mobility:

1) Global environment,
2) Quality of life in the city,
3) Economic success, and
4) Mobility system performance.

In some cases, indicators may impact on two, three or even four dimensions of sustainable mobility. For example, congestion increases air pollution, provokes a waste of time for the passenger and has high associated costs.

Out of the 22 indicator list, after consultations with Indore city officials, two (2) indicators namely “noise” and “resilience” was extracted from the indicator set and have not been calculated. The result is an indicator set of 20 indicators to be calculated for the city of Indore.

14 indicators have been calculated based on existing data whereas the calculation of 6 indicators is based on responses to a WBCSD SMP2.0 survey. Overall the indicator calculation has been carried out based on random sample selected for total metropolitan area of Indore and a population of ~26 lakh (2014). All input variables used to calculate the 20 indicators were based on most recent available figures (please refer to data source for each indicator). In case of any deviation from the values it is mentioned under “issues” for each indicator.

14 Indicators based on existing data:

1. Traffic Safety
2. Economic opportunity
3. Intermodal connectivity
4. Access to mobility services
5. Affordability for the poorest 25%

6. Net public finance
7. Green House Gases (GHG)
8. Vehicle pollution
9. Energy Efficiency
10. Functional diversity
11. Opportunity for active mobility
12. Congestion and delay
13. Mobility space usage
14. Occupancy rate

6 Indicators based on survey: (refer annexure 9.6 for survey details)

15. Comfort and pleasure
16. Quality of public area
17. Intermodal integration
18. Security
19. Inclusive Access
20. Travel time

Of the 20 indicators two of them with respect to the definition, scale, parameters are being explained below (refer annexure 9.5 for details of remaining 20 parameters). The "mobility space usage" parameter was ranked on the basis of the existing data available with the city and the "inclusive access" parameter was ranked based on the results from the survey conducted for this engagement.

Indicator	Scale	Score
Mobility Space Usage	0: 125 m^2 / capita 10: 25 m^2 / capita	10
Although the calculation shows good score, Indore would benefit from more balanced planning on efficient land use. There are very few parking places assigned with respect to city area. There is no separate facility for pedestrian/cycle and other vehicles		
Inclusive Access	0: 0% satisfaction 10: 100% satisfaction	3.3
○ *Among pregnant respondents, more than 80% are dissatisfied with availability of parking spaces for expectant mothers and the availability of benches around the city.* ○ *Among older persons, 62% are unsatisfied with the availability and location of parking spaces.* ○ *Among physically impaired, 73% are unsatisfied with the availability and location of parking*		

spaces.

- *Among visually impaired, 58% were unsatisfied with the access of public transport vehicles at stations or stops.*

Mobility Space Usage

- **Definition:** Proportion of land use, taken by all city transport modes, including direct and indirect uses.
- **Parameter:** Square meter of direct and indirect mobility space usage per capita.
- **Formula:**

$$LUM = \frac{\sum_i (LD_i + LI_i)}{Cap}$$

  - LUM = Land use for mobility applications [m²]
  - LDi = Direct Land use for mobility mode i [m²]
  - LIi = Indirect Land use for mobility mode i [m²]
  - i = Mobility mode [#]
  - Cap = Capita or number of inhabitants in the city [#]

- **Data Source:** various sources including iRites study
- **Scale**

Values	Units	Min. Scale	Max. scale
8.13	*m²/cap*	125	25

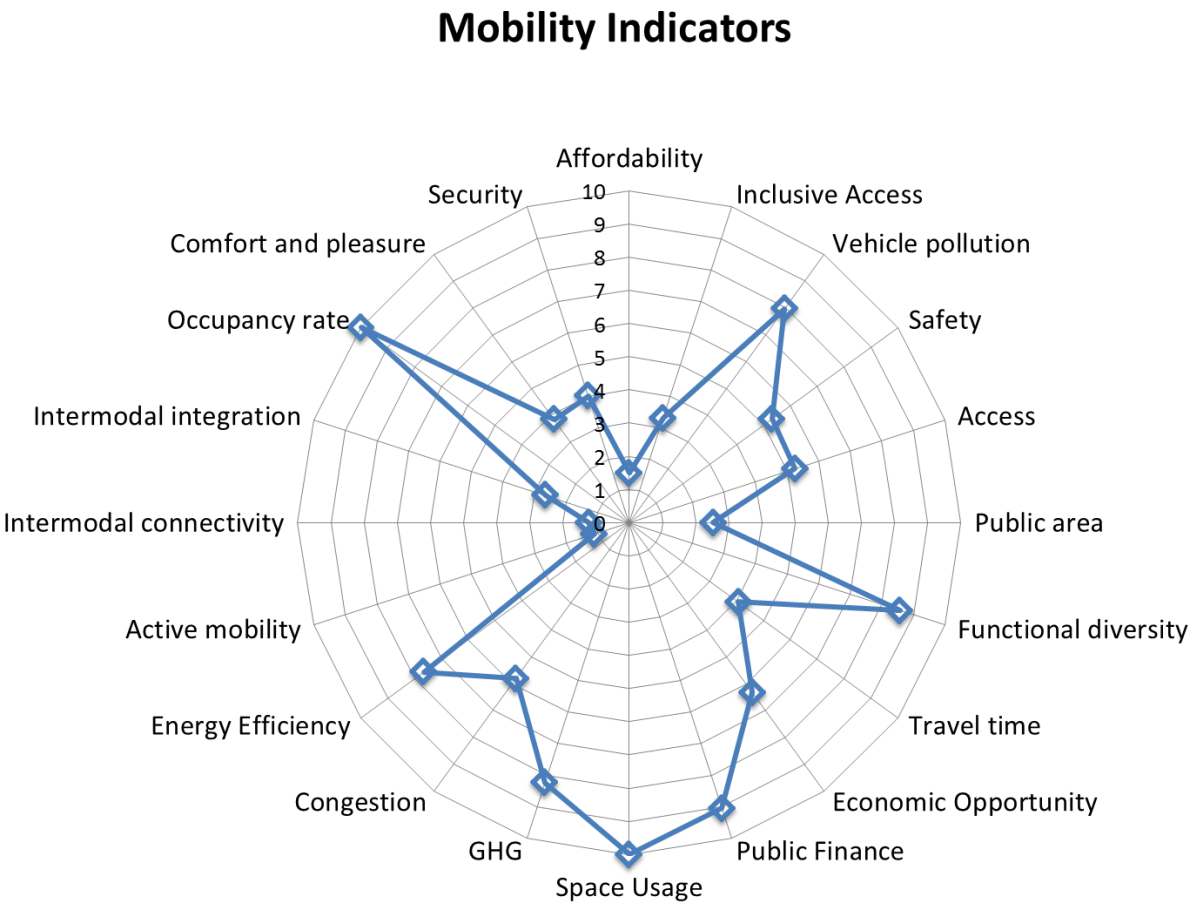
- **Score:** 10
- **Comments:** Although the calculation shows good score, Indore would benefit from more balanced planning on efficient land use. There are very few parking places assigned with respect to city area. There is no separate facility for pedestrian/cycle and other vehicles.

Inclusive Access

- **Definition:** The accessibility for deficiency groups to transport and transport services.
- **Parameter:** Average reported convenience of city transport for target groups.
- **Formula:** Average value of all responses with a weighting of 10, 7.5, 5, 2.5, and 0 for the most satisfied to least satisfied responses.
- **Data Source:** Survey

- **Scale:** 10, completely satisfied. 0, dissatisfied
- **Score:** 3.3
- **Comments:**
  - Among pregnant respondents, more than 80% are dissatisfied with availability of parking spaces for expectant mothers and the availability of benches around the city.
  - Among senior citizen, 62% are unsatisfied with the availability and location of parking spaces.
  - Among differently-abled, 73% are unsatisfied with the availability and location of parking spaces.
  - Among visually prejudiced, 58% were unsatisfied with the access of public transport vehicles at stations or stops.

The spider chart below shows the sustainable mobility footprint of the city of Indore by giving an overview of how each indicator rates on a scale form 0 (worst) to 10 (best) and the details pertaining to their definitions, parameters, formula, data sources, and potential issues for each of the 20 indicators calculated for the city of Indore can be referred in annexure 9.4

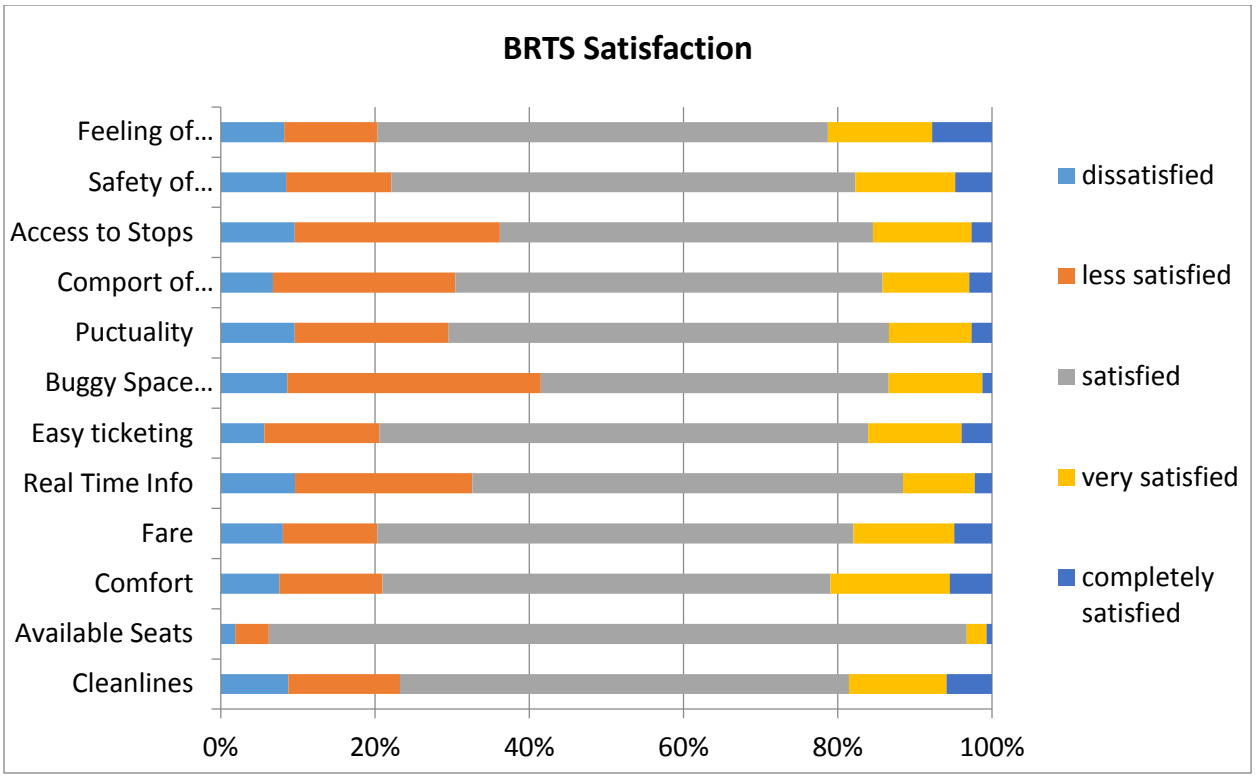


A comparison of the Indicator analysis (shown here in this Spider Chart, Scale from 0 to 10 with 10 being most sustainable) to the city's selected priority indicators confirms that those 7 chosen indicators are returning low sustainable mobility scores and addressing these indicators could substantially improve the sustainable mobility of the city.

Indicator Analysis: Values

			Scale Span			
Indicators	**Values**	**Units**	**Min. Scale**	**Max. scale**	***SCORE***	
Affordability	30%	*%*	35%	3.5%	**1.5**	**Affordability of public transport for the poorest people**
Inclusive Access	33%	*%score*	0%	100%	**3.3**	**Accessibility for mobility impaired groups**
Vehicle pollution	15.23	$NO_{x\,eq}$/ cap	75	0	**8.0**	**Air polluting emissions**
Safety	16.42	atalities/cap	35	0	**5.3**	**Traffic Safety**
Access	53%	*%*	0%	100%	**5.3**	**Access to mobility services**
Public area	25%	*% score*	0%	100%	**2.5**	**Quality of public area**
Functional diversity	0.86	*score*	0%	100%	**8.6**	**Functional diversity**
Travel time	58	*minutes*	90	10	**4.1**	**Commuting travel time**
Economic Opportunity	11%	*%*	0%	18%	**6.3**	**Economic opportunity**
Public Finance	-0.24%	*%*	-2.50%	0.00%	**9.1**	**Net public finance**
Space Usage	8.13	*m²/cap*	125	25	**10.0**	**Mobility space usage**
GHG	0.485	*GHG/cap*	2.75	0	**8.2**	**Emissions of greenhouse gases (GHG)**
Congestion	1.15	*index*	1.35	1	**5.8**	**Congestion and delays**
Energy Efficiency	1.20	*energy/km*	3.5	0.50	**7.7**	**Energy efficiency**
Active mobility	11%	*%*	0%	100%	**1.1**	**Opportunity for active mobility**
Intermodal connectivity	0.85	*IC/km²*	0	7	**1.2**	**Intermodal connectivity**
Intermodal integration	27%	*%score*	0%	100%	**2.7**	**Intermodal integration**
Occupancy rate	105%	*%*	10%	65%	**10.0**	**Occupancy rate**
Comfort and pleasure	38%	*%score*	0%	100%	**3.8**	**Comfort and pleasure**
Security	40%	*%score*	0%	100%	**4.0**	**Security**

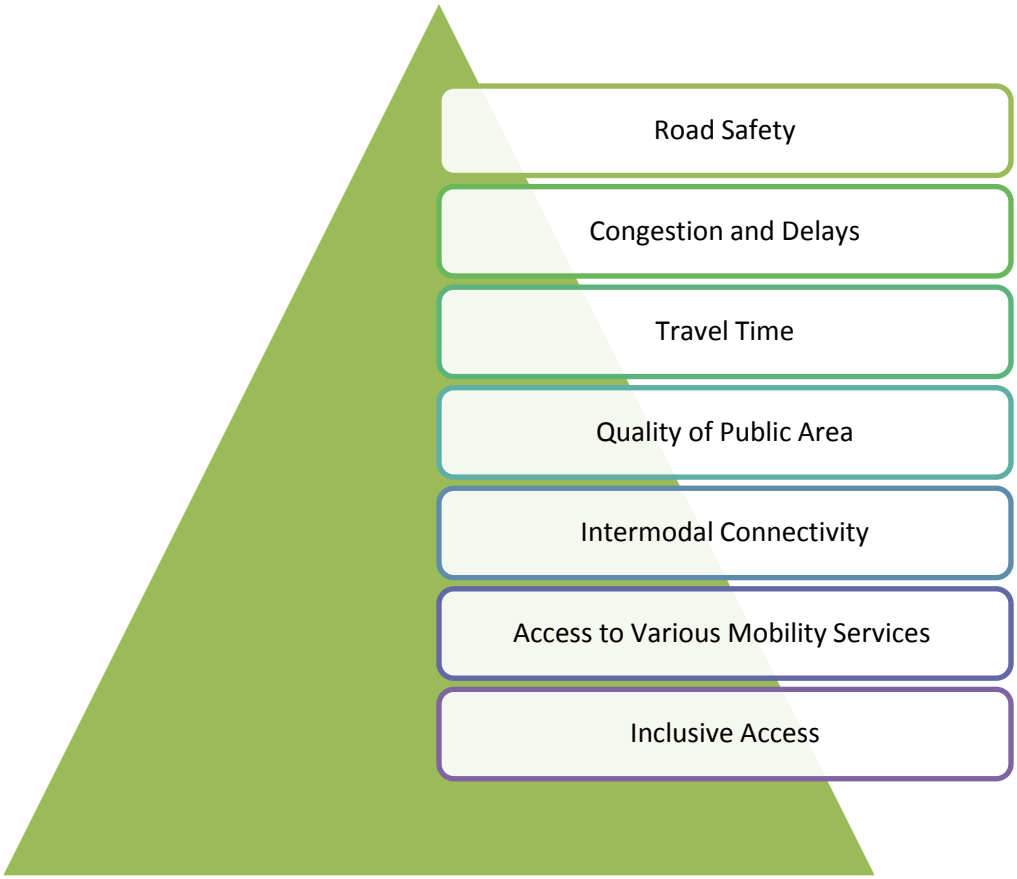
Also, as part of the survey, given the Bus Rapid Transit System (BRTS) is the key project of the city to provide fast and reliable public transportation, a question was specifically added to gauge citizen satisfaction level with the BRTS. The results from the survey are shared below. (Refer annexure 9.8 for more details)



On an average more than 75% population is satisfied with the BRTS except in case of availability of seats. The results from the survey, in combination with key data from the city, provided the inputs into the Indicator Analysis.

As part of its initiative for Comprehensive Mobility Plan 2021 (CMP 2021), Indore had commissioned a study of its mobility status and challenges. iRites had conducted extensive data accumulation, visual surveys of traffic patterns and analysis of contributors to mobility challenges. The iRites study was provided to the SMP2.0 CTF for purposes of fulfilling the data requirements of the Indicator analysis. The analysis and report from the study in combination with observations and insights of stakeholders provided a finer insight on the mobility challenges of the city. In particular, congestion studies, vehicle activity volume, vehicle occupancy rate, length of roads in the city and land use for mobility were utilized from the CMP 2021 study for the Indicator calculations.

Thus, keeping the spider analysis, survey and the reports, during the kick-off meeting, an initial list of priority indicators was developed and SMP 2.0 Indore city Task Force had agreed to work upon these seven (7) priority indicators (listed below):



5.2 Pilot Projects

When the priority indicators are selected by the city, the team identifies the best solutions from the SMP2.0 toolbox of best practices. The city of Indore carries out pilots such as changes to parking regulations (see example below) and the project engages with stakeholders to discuss and refine the solutions.

Two pilot locations namely –

1) Jawahar Marg, and
2) Sapna Sangeeta Road

were identified to explore solutions for developing a Comprehensive Pedestrian Mobility Strategy. These areas were shortlisted owing to the varied nature of activities undertaken around them – commercial/ wholesale/ retail activities. These activities result in mobility issues like mixed traffic, undivided roads, limited road width, parking menace, encroached footpaths, etc.

Specific reasons for selecting the above mentioned pilot projects is mentioned below –

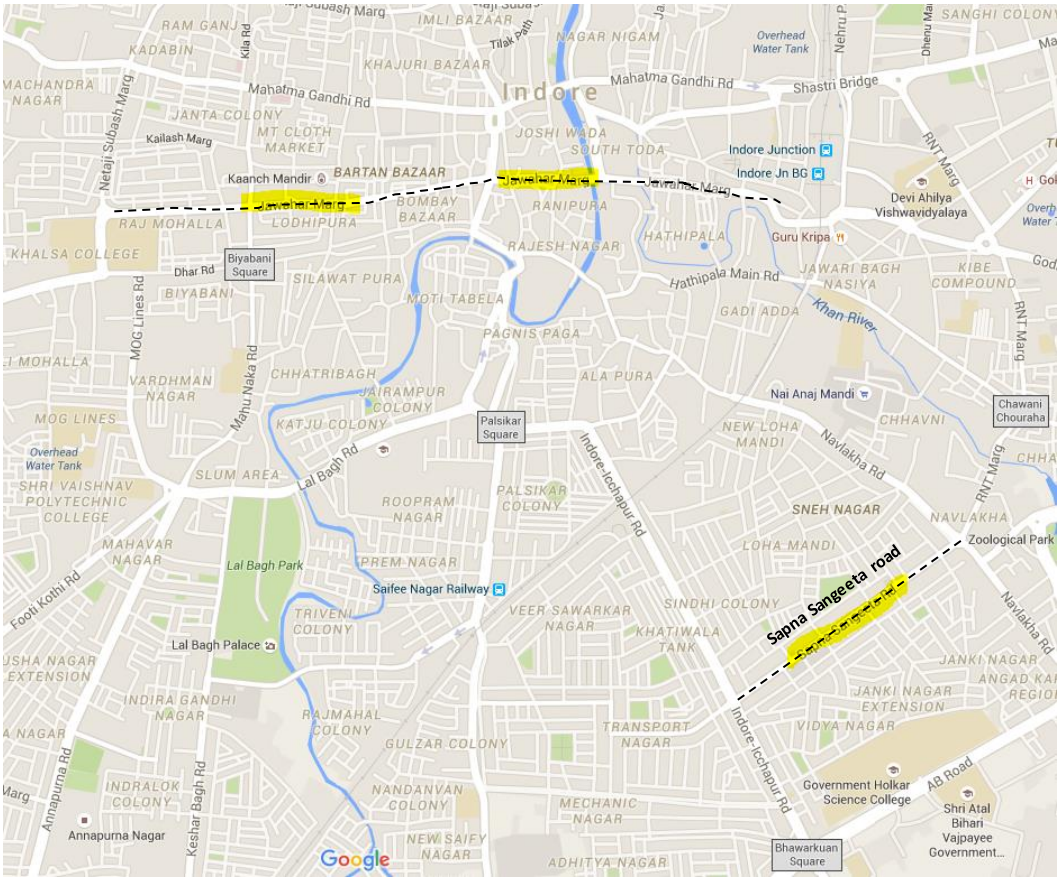
Jawahar Marg

- Due to heavy traffic
- No proper parking
- Irregular vehicle movement
- No vehicle moving marking on road (like divider etc)
- Maximum traffic move from this area as this is the only one straight connecting road between Rajwada and Subhash Marg
- Most importantly Jawahar Marg is major business hub and is surrounded by all wholesaler and retailer shops.
- Entire road's parking spaces is encroached by shop owners.
- Congestion due to movement and stopping (in front of shop) of loading vehicles

Sapna Sangeeta Road

- It is a connecting road of two major bus stands (Navlakha and Gangwal)
- No proper parking space is available
- Footpaths are being used be shop owners (especially auto dealers and food vendor)
- Major business hub i.e. all kind of business runs from this area

Once the locations for undertaking pilot projects were finalized, stakeholder dialogues were conducted to understand the potential issues that could arise out of implementation of these projects. On 17-Apr-15, a meeting was organized in presence of ADM (Additional District Magistrate-Mr. Sudir Kochar), SP-Traffic police (Mrs. Anjana Tiwari), In-Charge collector (Mr. Ashish Singh), IMC-commissioner (Mr. Rakesh Singh), Additional Collector (Mr. Dilip Kumar). These dialogues were widely attended by the representatives of local authorities, citizen representatives and the sector experts. These discussions provided compelling inputs on the issues and the enablers to implement these pilots.



1st Trial and stakeholder Dialogue: The first trial at Jawahar Marg as shown in the map above[14] explored solutions for managing heavy congestion in a 1.2 km commercial area. Here the congestion is majorly due to two reasons –

- Firstly, presence of diverse modes of transportation (pedestrians, auto rickshaws, hand carts, bullock carts, two-wheelers, four-wheelers, city buses, etc) over a small stretch
- Secondly, the sidewalks are blocked by shopkeepers' goods and illegally parked vehicles

Post understanding the concerns and listing of potential solutions, the trial was undertaken. As part of pilot project separate designated parking areas for different vehicle type, restricted loading and unloading zones, limited entry/ exit timings and controlling the encroachment were the major implementation points.

During the trail the team along with city officials also conducted meeting with stakeholders at Jawahar Marg to gather their feedback to further improve the traffic condition. Engagement with citizen and business stakeholders identified improvements to the original plan and achieved support for the final proposals.

[14] Source: Google maps

2nd pilot project and stakeholder dialogue: A meeting was held to re-organize the traffic system for smooth movement of vehicle and pedestrians at Sapna Sangeeta road. The aim was to have a workable mobility plan and to build Sapna Sangeeta as an ideal road. Keeping this in mind, a meeting with all major business class, administrative representative, social activists, press and media was conducted.

Few facts about Sapna Sangeeta Road:

1. *The one km road is surrounded by variety of activities like – trade & commerce, hospital, police station, residential etc.*
2. *People from all walks of life and all age group use the road (businessman, service class, young and old)*

Below is the detailed information on discussion:

Complaints:

- Lack of proper designated parking for 2W and 4W for both shopkeepers and visitors
- Footpaths encroached by goods displayed by shopkeepers or street vendors
- Agrasen square witnesses perpetual traffic jam due to proximity to Transport Nagar – movement of trucks/lorries/tempo
- Movement of police crane (to remove illegally parked vehicles) also slows the traffic speed

Suggestions:

- Turning radius at the intersections should be increased to avoid multiple back and forth movement of vehicles taking u turn thus reducing congestion
- Creation of level footpaths and removal of encroachment on it for smooth movement of pedestrians.
- Entry of heavy vehicles/tempo in the city to be restricted during peak hours (to be only allowed for few hours during off peak)

The meeting was very constructive and positive - as this was the first of its kind meeting of all stakeholders to recognize the concerns and derive solutions for the city as a group. This interaction

proved to be a good platform to have a frank discussion and understand pro's and con's of each concern and solution from each other's perspective - business associations, government, residents.

Few major decisions taken on Jawahar Marg are:

- Encroachments would be removed completely
- Center line and side line markings would be drawn for entire Jawahar Marg
- On street parking would on either side of the road would be allowed on alternate days
- Formulation of a monitoring committee consisting of one person from Administration, Indore Municipal Corporation and Police department each. The committee would be visiting Jawahar Marg thrice daily to monitor the progress and remove encroachments if any

However, it was decided to use this interaction as a stepping stone and to undertake more deliberations before any major decision on above Pilot projects is implemented.

Overwhelming response of stakeholder dialogues so far, encouraged the SMP 2.0 team to share the list of priority solutions with the stakeholders and get their inputs as a way of finding the fit purpose and enablers for the SMP 2.0 roadmap to the city.

Support from administration:

- Regular and frequent activities for encroachment removal from footpaths should be undertaken
- CCTV cameras should be installed at multiple locations
- Heavy vehicle movement in the area (both with origin/destination or passing by) should be restricted only during off peak hours - a designated timeframe


CNG
CNG
MP 09


शाह

पायलट प्रोजेक्ट : अधिकारियों के साथ हुई पहली बैठक में बोले व्यापारी

सपना-संगीता को बनाएंगे आदर्श रोड

दबंग रिपोर्टर ■ इंदौर

नवाहर मार्ग पायलट प्रोजेक्ट के तहत 900 मीटर में तीन बिंदुओं पर नई ट्रैफिक व्यवस्था लागू करने के बाद अब प्रशासन ने सपना-संगीता रोड पर ट्रैफिक सुधार का निर्णय लिया है। इसके लिए गठित कमेटी के अधिकारियों व स्थानीय व्यापारियों की शनिवार को बैठक हुई, जिसमें अतिक्रमण, फुटपाथ पर कब्जे, बदहाल पार्किंग सहित अन्य बिंदुओं पर मंथन हुआ। अच्छे सुझाव सामने आने के लिए व्यापारियों ने सुझाव दिए, वहीं अधिकारियों ने भी अपने बिंदु रखे। तय हुआ कि एक किमी के इस मार्ग का ट्रैफिक सुधारने के लिए हर स्तर पर प्रयास किए जाएंगे। इसके साथ ही इसे आदर्श ट्रैफिक के रूप में विकसित करने का संकल्प भी लिया गया।

शाम करीब पांच बजे से दो घंटे चली इस बैठक में कमेटी के एडीएम संदीप सोनी, सामाजिक कार्यकर्ता किशोर कोडवानी, व्यापारी प्रतिनिधि अंतिभाई पटेल, दिलीप शर्मा, रमेश लोरी, जगदीश शर्मा, विनोद पटेल सहित कई व्यापारी उपस्थित थे। शुरुआत में एडीएम संदीप सोनी ने व्यापारियों से उनका पक्ष जाना तो कई समस्याएं सामने आईं।

इन समस्याओं पर हुई चर्चा

- अलसेन चौराहा पर दूसरी ओर की सड़क अवाजाही से जाम लगता है।
- मार्ग के दोनों ओर वाहन पार्किंग के लिए जगह ही नहीं बचती।
- डिवाइडर बेतरतीब व चौड़े हैं। चौराहे पर बिलकुल पास से कट दिया गया, जिससे टर्न लेने में परेशानी होती है। तय तय चौड़े वाहनों की वजह से जाती है। ऐसे ही विपरीत दिशा में भी वाहनों में टकराव होता है।
- कई बड़े कॉम्प्लेक्स में पार्किंग है, तो कई में नहीं। इस वजह वहां आने वाले वाहन मुख्य मार्ग के दोनों ओर पार्क होते हैं।
- फुटपाथ पर ठेलर व्हीकल पार्क करना पड़ते हैं।
- पुलिस बेरा से वाहन उठवाती है, जो गलत है।
- डोलम व दुकानों के आगे के हिस्से में कई लोगों ने कब्जा कर लिया है।
- मुख्य मार्ग पर गन्ने के रस व फलों के ठेले खड़े रहने से ट्रैफिक बाधित होता है।
- नो पार्किंग का तो कोई मतलब नहीं रह गया।
- ऑटो स्टैंड व ऑटोमोबाइल वालों का अगला हिस्से पर कब्जा है। यहां कैसे वाहन खड़े रहते हैं।
- ऑटो रिक्शा के लिए तय पार्किंग नहीं। ये पूरे मार्ग पर खड़े रहते हैं।
- फिलहाल लोकल परिवहन का एक भी वाहन इस एक किमी मार्ग पर संचालित नहीं होता।
- बैंकों के ट्रांसफार्मर व जनरेटरों का कब्जा है।

इन बिंदुओं को लेकर एसडीएम संदीप सोनी व किशोर कोडवानी ने विस्तार से चर्चा की। निष्कर्ष निकला कि कई कॉम्प्लेक्स में पार्किंग की जगह नहीं छोड़ी है तथा फुटपाथ पर कब्जे के कारण भी काफी दिक्कत हुई है। मार्ग पर अतिक्रमण बोलम हैं, खासकर फूलचिट्टीनिक सामान के। अन्य कंपनियों के ऑफिस भी हैं। ऐसे में कहां ट्रैफिक सुधारने के लिए सहयोगात्मक रवैया अपनाना होगा।

इन मुद्दों पर आए सुझाव

- फुटपाथ को कब्जे से मुक्त कराना होगा।
- पार्किंग के लिए अन्य विकल्प तलाशना होंगे। इसके तहत सपना-संगीत के पास आईडीए या खालीप्लॉट, रहवासी क्षेत्र में स्थित खाली जगह आदि।
- ऑटो डीलर संचालकों द्वारा किए गए कब्जों को हटाना। हालांकि व्यापारियों का कहना है कि वे हमारे वर्ष के हैं, इसलिए पहले इनका हित देखना होगा।
- कई स्थानों पर सीसीटीवी कैमरे लगे हैं। यही स्थानों पर भी लगवाना।
- संकेतक, मार्किंग आवश्यक रूप से हो।
- एमओएस को टू व्हीलर पार्किंग में कन्वर्ट किया जाए।
- अलसेन चौराहा की ओर से गुजरने वाले दूसरे मार्ग का समय निश्चित हो।

इन बिंदुओं पर व्यापारी सहमत हुए। तय हुआ एक बैठक कर अन्य सुझाव व नए बिंदु तय करने को कहा गया, ताकि उन्हें अपनीजामा पहनाया जा सके।

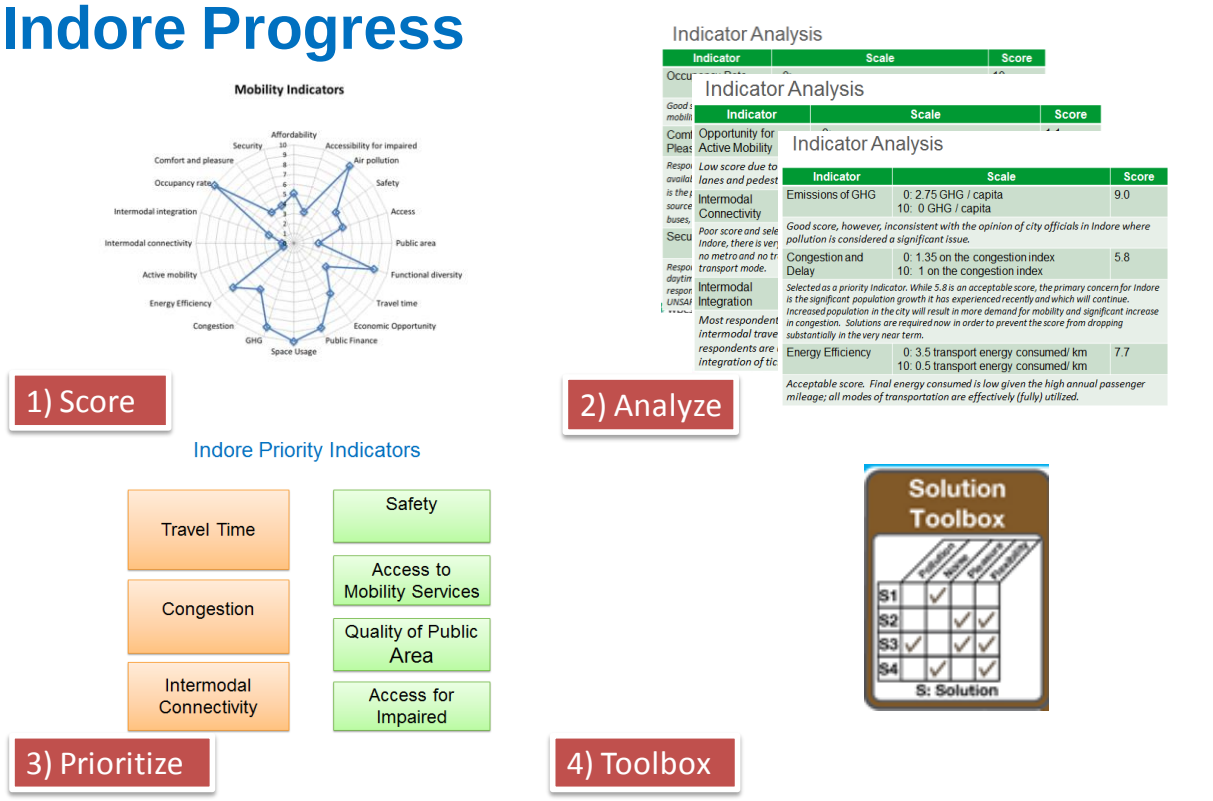
सुझावों को लेकर नोक-झोक

बैठक में किशोर कोडवानी ने उदाहरण देकर कई कॉम्प्लेक्स की व्यवस्था-अव्यवस्था का उदाहरण देकर गुलमर्ग कॉम्प्लेक्स का नाम लिया तो व्यापारी प्रतिनिधि दिलीप शर्मा नाराज हो गए। उन्होंने कहा इस मामले में मेरी अवस्था पूछता है और आप...। इस पर कोडवानी ने कहा यह तो सुझाव है, कोई निर्णय नहीं। इसे लेकर दोनों में नोंक-झोंक हुई। इस पर अन्य व्यापारियों ने शर्मा को शांत किया। इसके बाद शर्मा जयपुर जाने का हवाला देकर वहां से रवाना हो गए।

6. Priority Solutions

6.1 Potential Solutions

In September 2014 the CTF team met again with the purpose of determining the preliminary list of solutions to manage the sustainable mobility challenges in Indore. The CTF utilized the Solution Toolbox to determine best practices across the Globe which can be applied in Indore. In consideration of all 7 priority Indicators (issues highlighted by the city), the toolbox returned a set of over 70 potential solutions.



Indore followed SMP2.0 methodology to identify Sustainable Mobility Solutions

In November 2014, using the knowledge of city along with confirmation from city representatives, the team was able to filter this initial list into 34 potential preliminary solutions mentioned below -

Potential Solutions to Priority Solutions

City Impact: 5+year implementation solutions

City Impact: 2-5 year implementation solutions

City Impact: 1 year implementation solutions

Solution Name	Safety	Congestion and delays	Access to mobility services	Intermodal flexibility	Access for deficiency groups	Quality of public area	Travel time	City Impact
Workplace car sharing	0	0	3	0	1	0	0	4
Bike-sharing	0	2	2	2	0	1	2	9
Shuttle buses to the business district	0	3	2	1	2	0	2	10
Bus Rapid Transit	2	1	0	0	2	1	2	8
Dedicated company shuttle bus	1	2	1	2	1	0	2	9
Bus Only Lane	0	2	0	0	0	0	2	4
Mobile NFC Ticket Payment	0	0	0	3	0	0	1	4
Smart Card	0	0	0	3	0	0	1	4
SMS Ticket Payment	0	0	0	3	0	0	0	3
Limit loading/unloading times	0	2	0	0	0	1	1	4
Integrated bicycle strategy plan	2	2	0	1	0	1	2	8
Dedicated bicycle lanes	2	1	0	0	0	0	2	5
Visual displays at pedestrian crossings	3	0	0	0	0	0	0	3
Reduced Speed Zones	3	1	0	0	0	1	0	5

*** = Priority Solutions**

Toolbox provided mobility solutions catered to meet priority indicators

6.2 Solution Prioritization

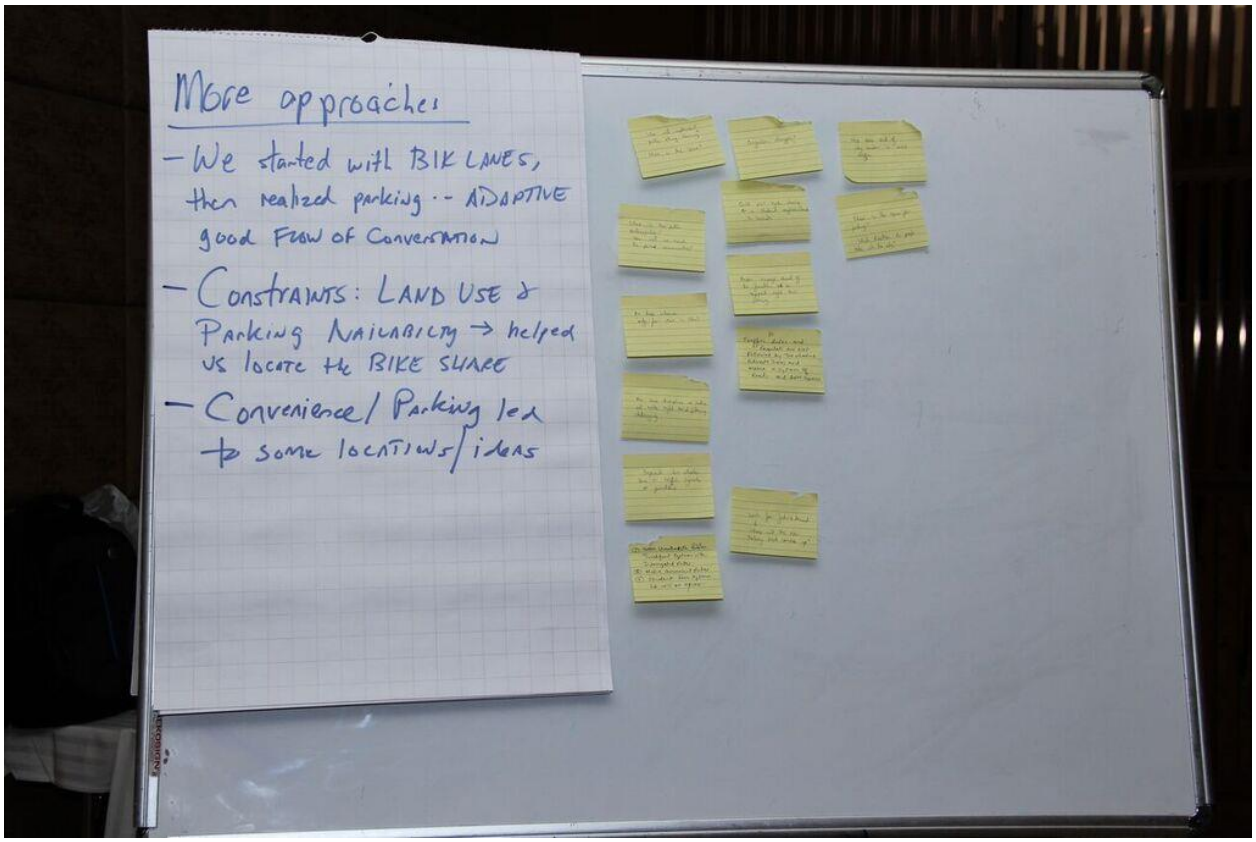
The 34 potential solutions were presented to city in a meeting in November 2014. These 34 solutions can be categorized into 5 major and 15 sub categories as mentioned below -

Bicycle Mobility Solutions	1. Bike Sharing 2. Dedicated Bicycle Lanes 3. Integrated Cycling with Public Transport
Pedestrian Mobility Solutions	4. Pedestrian Mobility Strategy 5. Visual Display at Pedestrian Crossings
Congestion Solutions	6. Park and Ride scheme 7. Right turn filtering lanes

	8. No Vehicle Zone
Improve Public Transport	9. Passenger Friendly Bus Stops 10. On-board Bus Travel Information 11. Intermodal Travel Information / Multi-modal Real time Information Apps 12. Access of public transport to all
Technology Solutions	13. Parking fee enforcement strategy 14. Smart Ticketing systems 15. Smart Parking

A stakeholder dialogue was again held in July 2015 with Mr. David Berdish (Berdish Consulting) leading the exercise on behalf of WBCSD. The discussion was held with key stakeholders and city officials to discuss the application of the shortlisted solutions in Indore. Reference material was provided by WBCSD to offer examples of the seven priority solutions implemented in other global cities.

Stakeholders were divided into **10 groups with 5 members each**. Each group was given a map of Indore and asked to identify the locations where they would recommend the implementation of the 15 priority solutions. They were also requested to share the rationale and envisaged challenges associated with their recommendations.


More approaches
- We started with BIK LANES, then realized parking -- ADAPTIVE good Flow of Conversation
- Constraints: LAND USE & Parking NAILABILITY → helped us locate the BIKE SHARE
- Convenience/ Parking led to some locations/ideas

Superior quality inputs were received from the enthusiastic and interactive group of stakeholders. Most people proposed for greater pedestrianization, creating cycle tracks and promoting other forms of non motorized transportation like GPS enabled e-rickshaws or bicycle sharing. Some others proposed for solutions like smart parking, IT enabled solutions for traffic management, etc. Brief list of these suggestions is given below:

Recommendations:

- Locations for iBike parking should be situated on the main roads entering into the city from outskirts (Refer annexure 9.7 for details of I-Bike program of Indore)
- Parking should be free of charge or one time charges to be collected during the registration of the vehicles
- Encroachment is still a big challenge
- Bicycles to be permitted in no-vehicle zone
- Proper route marking is very important; Signs are required for smooth traffic movement
- Require strict penalty policy on traffic violation of rules
- Deployment of Public transportation in and around “no-vehicle zone” to manage its demand
- Major ‘No Vehicle Zones’ should be introduced at Rajwada, Palasia, Malwa Mill, Sarafa and Malharganj areas
- A future requirement of subway at Palasia, Chanakyaburi Square, Geeta Bhawan, Regal Square
- Few places had left/right turn issues like DRP line square, White church, CHL Apolo Hospital, Country Inn
- For the use of more public transport Multilevel parking requirements were highlighted at Imli Bazar, Lalbagh, Choithram Road, Poddar Plaza, Nagar Nigam, Bada Ganpati, Bombay Hospital and Rajwada

Key Take Away:

- Bike share locations need to be supported with bike lane strategy
- Continuous enforcement and Governance is required to improve the mobility
- CCTV Cameras need to be installed to ensure that the lane is being used by bicycles only
- Implementation is about changing behavior, which is a major challenge for the Administration
- Need to put the sign boards well in advance of the filtering lanes, the bicycle lanes etc.,
- Bollards need to be installed at pedestrian path to avoid vehicle entry
- Improve public transport waiting areas, such as bus stops. Cleanliness was cited as the most important aspect among 12 key attributes for using public transport.

The Chairman of the Steering Committee and the city officials demonstrated their inclination to implement all the solutions in 2 to 5 years. The following were agreed as the priority solution set:

- **Short Term:** smart card or SMS ticket payment, dedicated bicycle lanes, visual displays at pedestrian crossings. It was noted that the city has initiated a bike sharing scheme during November 2014.

- **Mid Term:** integrating cycling and public transport, intermodal travel information centre, parking fees enforcement strategy. The city noted that integrated traffic management system will help city planning for congestion mitigation due to processions / weddings etc.

- **Long Term:** pedestrian mobility strategy; further, it was agreed that a pedestrian mobility strategy required a further exploration and dialogue with key stakeholders in particular shop owners. It was agreed to initiate a pilot project in this regard.

6.3 Best Practices

When planning any solution it is most advisable to look for similar issues in similar context/ region and understand the steps undertaken by them. Research of the failed pilot projects is as important as the success stories. Below are international and national case studies for the 15 priority solutions planned for Indore.

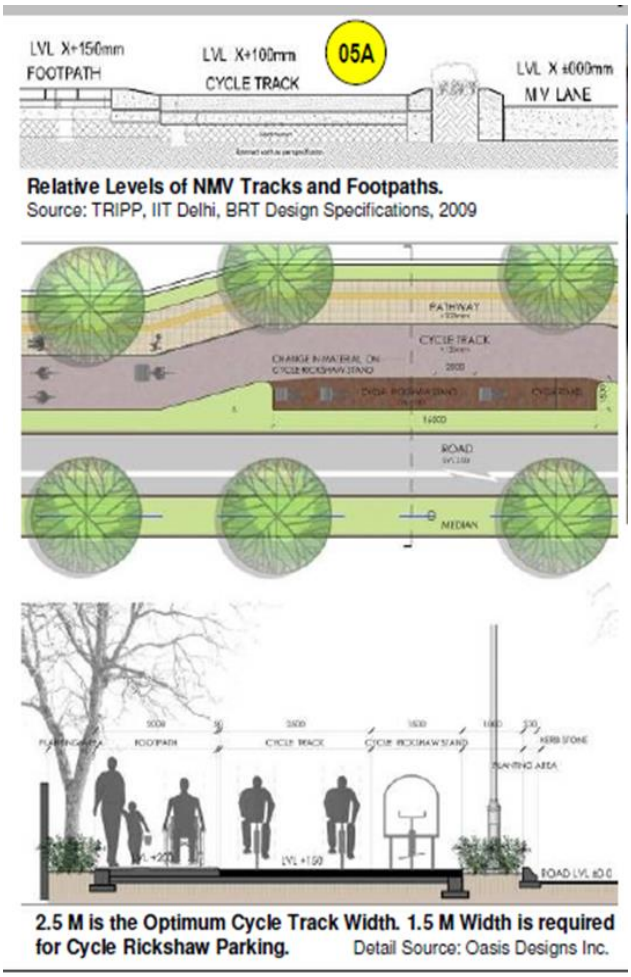
6.3.1.1 Bike Sharing

On May 1, 2008, the Hangzhou city government launched the first information technology–based public bike sharing program in China. Hangzhou government also initiated bike sharing as a way to encourage seamless public transportation among bus, metro, and cycling modes.

The goal of the Hangzhou Public Bicycle service is to provide a free and convenient public bike system for residents and tourists, so that bike sharing can act as a seamless feeder service to public transit throughout the city. As of March 2011, Hangzhou Public Bicycle operated 60,600 bicycles with 2,416 fixed stations in eight core districts.

Key features of Hangzhou bike sharing:

- Hangzhou Public Bicycle[15] uses smart-card technology, automated check in and check out, and distinguishable bicycle docking stations. For the smart-card, the system requires an initial 200 yuan (INR 2,100) deposit for bike use.
- The system uses fixed bicycle docking stations. On its launch, the program initially relied on 31 mobile docking stations that could be relocated for program optimization. Once usage patterns were determined, the mobile stations were modified to fixed stations.
- For the first hour, users can ride for free; at the second hour, a user has to pay 1 yuan (INR 10 - 12); at the third hour, the user has to pay an additional 2 yuan (INR 20 - 25), and any additional hours cost 3 yuan/hr (INR 30/hr). Users pay for the time duration for which a bike has checked out and checked in a station.
- So far, 90% of the trips made are free of charge as the usage time is less than an hour.
- Users can use their public transit cards for bike sharing and receive a transit discount, because the program's principal aim is to enhance and link various modes of transit available in the city.
- Also, Hangzhou has experienced minimal bike theft or vandalism because of the two reasons –
    - cameras at each docking station and
    - bikes are very low cost single gear bikes
- Low cost bikes have an additional benefit - the maintenance and service costs are also very low as compared to other modes of transportation.
- As part of this effort, to make cycling safe 84% of the secondary and main roads in Hangzhou are physically separated between motorized and non-motorized vehicles, providing a safer riding environment than most other Chinese cities.



Although Hangzhou's initiative was inspired by Paris' bicycle sharing system, the City decided to conduct independent research on the most common problems affecting bike sharing systems.

[15] http://www.hicenter.cn/columns_detail.asp?id=434726
http://121.8.226.156/en/poll/detailed-12.aspx?polltype=1

It identified five problem areas[16]. These are:

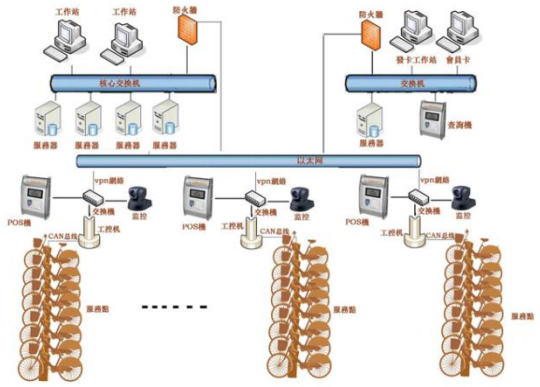
- the planning and location of service points;
- bicycle returning and having bikes when and where they are needed;
- customer care;
- repairs;
- business model

All five of these problem areas were addressed with particularly innovative approaches.

Service points are on average 300 meters apart, solving the last mile problem. Mobile applications have been devised to enable users to pre-book their bikes and to inform the system where they intend to return the bike. A smart system predicts where and when bikes are needed and to move the bikes accordingly. The 100 or so busiest service points are staffed to help customers during peak times; all other service points are equipped with hotline support. Kiosks are availed at each docking point and are designed to provide products and services such as food and beverages, lottery tickets, phone cards, etc. They also serve as a platform for advertising.

The business model of "government invests, enterprise operates is the result of the cooperation of many different partners. Three different government departments participate in this project and provide policy and fiscal support; various local colleges and universities offer smart systems support, and civil society has provided appreciable human resources (volunteers).

Perhaps the most important outcome besides helping to solve traffic congestion is how the City of Hangzhou decided to heed public complaints about traffic congestion and to offer a truly world class customer-oriented and self-sustaining service. This lesson is applicable everywhere in improving quality of life in our cities.



Bike sharing project is already being implemented in Indore – (refer annexure 9.7 for details)

[16] http://121.8.226.156/en/poll/detailed-12.aspx?polltype=1

6.3.1.2 Dedicated Bicycle Lanes

Safety and security are a core components in creating sustainable urban mobility, particularly in making roads safer and more secure for the 'vulnerable'.

Further, providing cyclists with high-quality and segregated routes as shown in the image below[17] can contribute to promoting the use of bicycles as a cheap, safe, clean and attractive means of transportation into the city centre.

6.3.1.3 Integrated Cycling with Public Transport

The more cycling is integrated with public transport services, the easier it becomes for people to combine cycling and public transport on a single trip. This in turn increases the use of both cycling as a mode of travel as well as increasing patronage on public transport

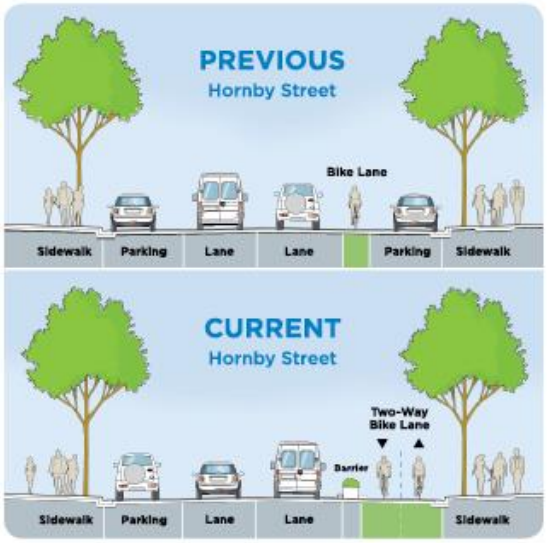
How to Integrate Cycling with Public Transport:

- Separation of **cycling lane** and motor carriage way with curbs
- Separation of cycle lane and motor carriage way with plastic bumps[18] (as shown in image below)
- Sufficient safe **parking facilities** for cycle at railway stations/bus stands proves highly in favor of public transport and cycling together

[17] https://at.govt.nz/beachroadcycleway
[18] http://www.fastcoexist.com/3025799/these-recycled-plastic-dividers-can-create-a-bike-lane-in-a-second

- Short and well developed cycle lanes from rural areas into the city center and train stations

To promote cycling in the city Vancouver city re-designed the streets and created protected bike lanes on many downtown streets, including Burrard Bridge, Carrall Street, Comox/Helmcken Street, Dunsmuir Street, Dunsmuir Viaduct, and Hornby Street[19]



This drawing shows the difference between the previously painted bike lane and the current protected bike lanes on Hornby Street. On streets such as Hornby and Dunsmuir streets, protected bike lanes provide two-way travel for people cycling on the same side. This can create the need for additional traffic signals for both cycling and walking traffic.

[19] http://vancouver.ca/streets-transportation/protected-bicycle-lanes.aspx

Integration of public bike sharing system into public transport could further motivate passengers to use bicycle for the last mile (instead of a car) by e.g.

- Dense network of bike rental stations
- Tariff integration (mobility card for public transport and bike rental)

6.3.1.4 Pedestrian Mobility Strategy

While 51% of all trips in Mumbai are by walking, yet pedestrians are the most vulnerable road user[20]. Livable communities are those, where the pedestrians come at the top of the pyramid, followed by cyclists and users of public transportation. The rest of the modes of travel are placed much below on the ladder of livability[21].

Street design practice in India is beginning to recognize the integral role of walking in any sustainable transport system. Increasingly, engineers and planners are emphasizing the need to design "complete streets" that make walking safe, comfortable, and convenient. In this regard many agencies and cities have either prepared street design guidelines or are planning to prepare and implement them. Following section discusses some of the key street design elements which have been taken from multiple sources.

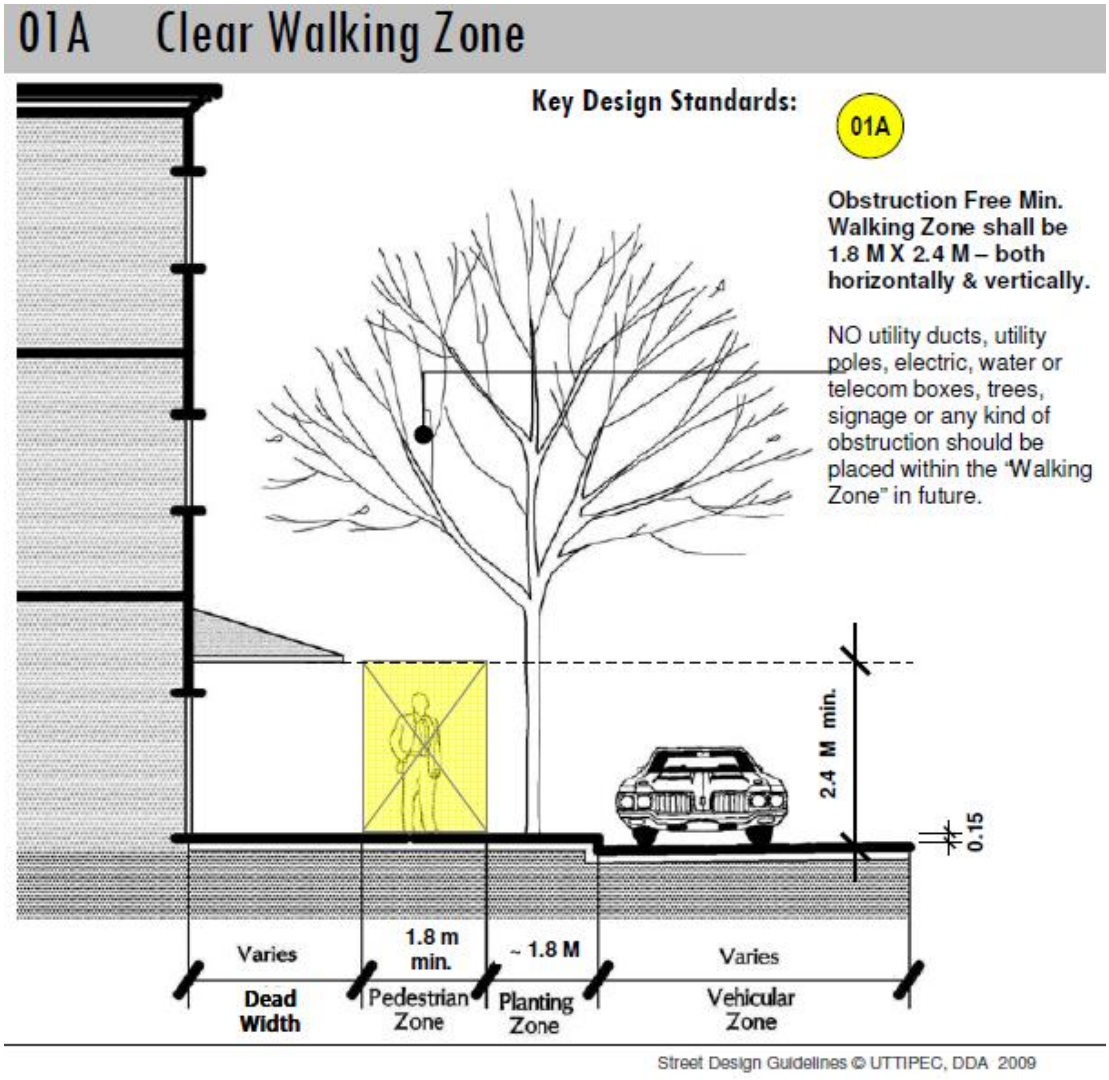
Zoning system

Comfort, continuity, and safety are the governing criteria for the design and construction of pedestrian facilities. For this reason, the footpaths are divided into three main zones: the frontage zone (also known as "dead width"), the pedestrian zone, and the furniture zone. Each of these zones plays an important role in a well-functioning footpath.

Frontage zone

Provide pedestrian walkways along store and building fronts free from motorcycles and motor vehicles and parked trucks or vehicles. The frontage zone can vary from a minimum width of 0.5m in residential zones along a compound wall to 1.0m in commercial zones.

[20] http://wricitieshub.org/sites/default/files/Street%20Design%20Guidelines%20for%20Greater%20Mumbai.pdf
[21] http://www.urbantransport.kar.gov.in/pedguide_final_21stJan2014.pdf



Width

The width of the footpath can vary as per the adjacent land use. Footpaths in residential areas require a minimum clear width of 1.8 m, which is enough space for two wheelchairs to pass each other. For commercial areas, the clear width should be at least 2.5 m and for high intensity commercial zones the clear width should at least be 4.0 m.

Furniture zone

Furniture zone should at least be 1.0 m in residential zones to 1.5 m in commercial zones.
Footpaths designed as per the zoning system provide uninterrupted walking space for pedestrians.

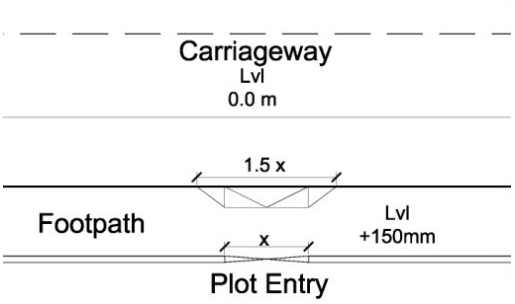
Height and Surface

The height of the kerb above the carriageway should not exceed 150 mm.

Footpaths should have flat walking surfaces, allowing for proper drainage and preventing puddles from forming). Guide tiles should be laid along the length of the footpath to assist persons with vision impairments.

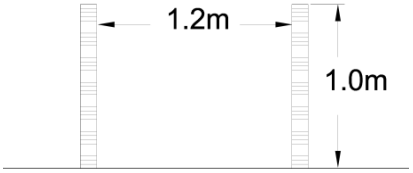
Plot Entrance

In order to maintain continuity of footpath, raised driveways can be provided at plot entries where footpath continues at the same level but vehicles have to drive over a gentle slope to access the plot. Plot entry should be designed depending upon vehicle type, and may lie in the range of 3m - 5m. Width of plot entrance slope can be approximately 1.5 times the width of plot entry.



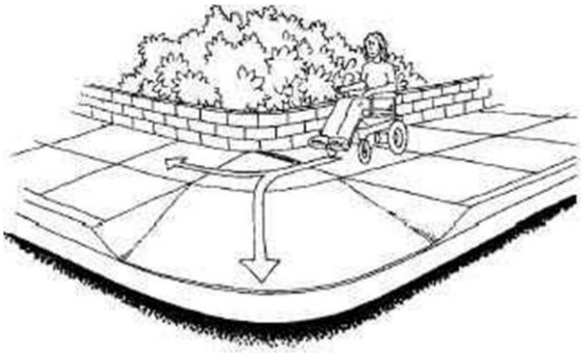
Bollards

Bollards are used to stop vehicles from entering the footpath. They should be placed such that they permit a person with wheelchair to pass through.



Planning the Street Corners

Street corners are where the sidewalks of two streets meet, form an important part of the sidewalk network. Crosswalk (like Zebra crossing, etc.) usually meets the sidewalk at the street corners (except at midblock crossings). It is a refuge for pedestrians, waiting for their turn to cross the road. Street corners also tend to be a meeting point for people to stand and interact. In addition street corners host various utilities like traffic signal poles, traffic signal cabinets, light poles, street name signs etc. Hence street corners should be designed to accommodate all these activities.



Street corners should be sloped down to the road level for provision of crossing of the old and the differently abled people.

Street Vending

Street vending provides essential goods and services to a wide range of population groups. If designed properly, vending can be accommodated in the streetscape without interfering with other uses. The furniture zone of the

footpath or a bulb-out in the parking lane are ideal locations for vending.

Pedestrian Refuges

Pedestrian refuge islands must also be provided in the medians. The refuges should be large enough to handle estimated pedestrian volumes[22].

Tree Pits and Tree Grates

- Tree guards should be provided for young trees. Local materials like bamboo to be used.
- Tree gratings finished at the same level as surrounding pavement allow people to walk over them while still allowing water, air and nutrients to access the roots.

Pedestrian Plan, Oakland, CA

The City of Oakland adopted the Pedestrian Master Plan (PMP) in November 2002. The plan designates a network of pedestrian facilities and distinguishes roadway segments and intersections in particular need of safety enhancements to better serve pedestrians. For the estimated pedestrian volume, the city used an innovative' modeling tool called the "Space Syntax Model" throughout the city, based on land use, population and other network characteristics. It was later combined with crash data, traffic data, and community input to identify and prioritize areas with both safety problems and high pedestrian demand.

The focal points of the Oakland pedestrian plan included a designated pedestrian network and a set of broad pedestrian policies to help identify future components of the designated pedestrian network, and improve the environmental quality of the existing network. The result of above modeling generated series of maps which identified the proposed network, consisting of primary and secondary pedestrian routes along with city streets, off-street pedestrian paths, important connections

[22] https://www.itdp.org/wp-content/uploads/2014/07/Footpath-design-131030.pdf

between neighborhoods, and areas in need of attention due to high safety risks, or location near schools or other activity centers.

Policy areas identified by the plan included safety, land use, and education. The plan encourages a mixed land use with a combination of high density areas to create higher volumes of pedestrians. At the same time, it recognizes that pedestrian facilities and amenities in both existing and forecasted areas of high densities should be upgraded and maintained in order to sustain a desirable level of pedestrian activity. Encouraging higher densities also supports transit, which is most effective when there is good, direct pedestrian access to reach it[23].

6.3.1.5 Visual Display at Pedestrian Crossings

Provide traffic signals for ensuring smooth flow of traffic and safety of pedestrians and other road users. Include auditory devices for the safety of visually handicapped persons, pedestrians and cyclists (as shown in the image) [24].

Adaptive signal control technology adjusts the timing of red, yellow and green lights to accommodate changing traffic patterns and ease traffic congestion. The main benefits of adaptive signal control technology over conventional signal systems are that it can -

- Continuously distribute green light time equitably for all traffic movements
- Improve travel time reliability by progressively moving vehicles through green lights
- Reduce congestion by creating smoother flow[25]

The intelligent traffic signaling system proposed in Delhi, at any given junction will have a system of CCTV which will gather footage of traffic inflow and change the color of the traffic light based on actual volume of traffic and pedestrian and will not be timer-based. The system will gauge the nature of vehicular and pedestrian traffic pattern and if it sees a big collection of people near the zebra crossing it will give precedence to pedestrians over vehicular traffic. In Delhi the idea is to upgrade the existing systems by installing a unit of cameras at each junction. These cameras are linked to the central control room where the automation software guides the traffic lighting system. The estimated cost for the

[23] https://www.fhwa.dot.gov/planning/processes/land_use/case_studies/oakland_ca/
[24] http://www.alamy.com/stock-photo/control-pedestrian-crossing-safety.html
[25] http://www.fhwa.dot.gov/innovation/everydaycounts/edc-1/asct.cfm

proposed system is around Rs. 10-12 Lakh, which includes additional four cameras at a four-point intersection.

The system also alerts road users on the status of traffic on a stretch of road. The software, integrated with the variable messaging system (VMS) displays on VMS boards, color-based signals to alert people about the nature of traffic volume ahead. For example, if one is travelling across the Yamuna River and there are three roads ahead, a VMS board will alert travelers about the road having higher traffic through a set of indexed color signages (e.g. deep red for thick traffic and a light color for thinner traffic)

Ahmedabad:

There are around 256 signalized intersections in Ahmedabad which Ahmedabad Municipal Corporation intends to be functional and upgraded to ATCS (Area Traffic Control System) mode. AMC wants to upgrade the entire system to have a camera based Vehicle Actuated (VA) signaling system. As against the conventional traffic signaling, the proposed Intelligent Signaling System at Ahmedabad comprises of Adaptive Traffic Controller and CoSiCoSt software platform which shall respond to dynamic traffic demands based on real time vehicle presence information by vehicle detection camera at that particular arm/ junction and accordingly assign the timings to the green signal. AMC has appointed DIMTS (Delhi Integrated Multi-Modal Transit System) to implement this 'Intelligent Signaling System' along the city's Bus Rapid Transit System (BRTS) corridor and 256 junctions.

DIMTS will install IR cameras on the signal poles at each junction on the BRTS corridor, which will monitor and record all movement in the corridor 24x7. The intelligent system will optimize signal timings and give priority to transit vehicles at junctions, while ensuring safe and convenient movement for pedestrians and non-motorized transport.

Mumbai

At present, 253 smart signals in south and central Mumbai are operational which were installed since 2007 through World Bank funding. Now BMC intends to install smart signals at other 367 of the busiest junctions in the suburbs.

Adaptive Traffic Control system in Mumbai has several loop-like sensors on the surface of the road which record vehicular movement and sends the information to a control room. Depending on traffic flow, traffic signals shift from fixed-time mode to real-time mode. Accordingly, the control

Lesson Learnt

Municipal Corporation of Greater Mumbai had initially planned ATC project which was sensor based inductive loops system for traffic detection but it was later eliminated because inductive loops, which are embedded in the ground, often failed in monsoon. Their maintenance involves digging up of roads, is expensive and causes traffic disruption at intersections. In contrast, the above mentioned ground video based solution provides trouble-free operation.

room increases or decreases signal time. The sensors lying in straight line below the surface of the road calculates the number of vehicles crossing them by dividing the total weight detected by average vehicular weight. These sensors are also connected to CCTV cameras installed at the junctions to take the visual data.

Achievements:

- As indicated by the Mumbai police, the stoppage time at traffic signals have reduced considerably after the installation of intelligent traffic signals. Haji Ali, for instance, where the stoppage time has come down from 220 seconds cycle time to 180 seconds cycle time. On an average, the signal cycle time has reduced by over 25 percent. The impact of the project is visible on major corridors where the total travel time has come down.
- Mumbai's recently implemented ATC system has also won the award for the 'Best ITS 2011 Project' from the Union Ministry of Urban Development.
- The ATC has also resulted in improved traffic flow which has reduced road causalities by 15 percent and also reduced pollution levels. Encouraged by the results, the Mumbai city authorities have installed LEDs in traffic lights which accrued savings upto 85% in energy consumption by the traffic light system.

6.3.1.6 Park and Ride scheme

A vehicle parking facility typically located on the outskirts of an urban area where mass transit transport links, typically buses or trams, are available to connect the user to the urban center (business district / shopping district). Reducing Congestion and delay from urban areas is the driving indicator for this service. When the parking facility is not far from the city center the transport offer can be complemented by a bike rental system (as shown in the image below)[26].

The success of park and ride schemes is dependent on two important factors–

1) Access to modes of transportation like MRTS/bus/para transit should be within walking distance
2) Parking facilities to have both 4 wheeler and 2 wheeler facilities along with public convenience.

The location and number of bus stops should be planned based on bus route planning and optimization plans.

As for instance the number of buses in various cities of India for which the park and ride system if implemented would have to be designed for is -

[26] en.wikipedia.org

Ahmedabad

- Ahmedabad Municipal Transport Service (AMTS) runs the public bus service in Ahmedabad. At present, AMTS has 750 buses serving the city. In addition AMTS is also responsible for 50 BRTS buses, and 100 feeder buses. The administration of AMTS comes under the Ahmedabad Municipal Corporation. During 2009-10 additional 730 low floor buses were sanctioned under JnNURM.
- Bus Operating Characteristics and Fleet Requirements as per BRTS Report

Year	Occupancy Ratio	Avg. carrying Capacity/Bus	Vehicle Utilization (kms)/ Day	Fleet Utilization	Total Fleet Required
2006	60	55	214	81	738
2007	60	54	238	93	1215
2008	65	55	243	93	1110
2009	65	55	248	91	1424
2010	65	55	244	91	1876
2011	70	63	244	91	1565
2012	70	63	241	90	1911
2013	70	63	243	91	2049
2014	70	63	245	91	2337
2015	70	63	248	91	2336

- The city bus service for Jaipur is managed by Jaipur City Transport Service Limited (JCTSL). It was introduced by Rajasthan State Roadways Transport Corporation (RSRTC) in 2007. Till 2009, the company had a fleet of 400 buses, of which 20 were A/C Low floor and 380 were non A/C low floor buses. During 2009-10 additional 400 low floor buses were sanctioned under JnNURM for Jaipur.

The number of buses required per 1,000 population depends on the public transport mode share, the presence or otherwise of rail or other public transport modes, the capacity of the buses, the extent to which they may be utilized in terms of daily kilometers per bus, and the daily number and average length of bus journeys undertaken by each inhabitant of the city.

With so many variables the minimum requirement varies considerably from city to city, but will typically lie between 0.5 and 1.2 per 1,000 population as per the Urban Bus Toolkit which was jointly prepared by World Bank and ppiaf[27] during 2006. With higher tendency of usage of public transportation the factor increase from 0.5 to 1.2, depending on the mobility behavior shown by the city. Based on this basic thumb rule the range for number of buses is as shown in the table *(however for more accurate number more extensive traffic modeling is required)*

[27] The Public-Private Infrastructure Advisory Facility (PPIAF) is a multi-donor trust fund that provides technical assistance to governments in developing countries.

Name of the city	Census 2011 population	Number of buses during 2009-10	Additional JnNURM sancioned buses during 2009-10	Total buses (Existing+JnNURM)	Requirement during 2009-10 based on 2011 population	
					Requirement as per 0.5 factor	Requirement as per 1.2 factor
Ahmedabad	5,577,940	750	730	1480	2,789	6,694
Jaipur	3046163	400	400	800	1,523	3,655
Indore	1,964,086	110	175	285	982	2,357

In Indore, the provision for park and ride facilities will play an important role in achieving congestion free roads in the central area. Locations have been identified very near to the periphery of central area to provide interchange between public and private mode. These are existing multi-level parking near Nagar Nigaam and proposed multi level parking in front of Bada Ganpati temple. (from Indore Interim Report iRites)

6.3.1.7 No Vehicle Zone

Since October 2001 a Limited Traffic Zone (LTZ) to access the historical city centre of Rome (with an extension of 4.8 sq km) has been implemented and controlled by an Automated Access Control System.

Result

The total flow of incoming traffic already decreased by 15% compared to the preceding year and there has been increase of 6% in public transportation use

Initially the area faced approximately 250,000 trips per day and the manual enforcement of restrictions proved to be a difficult and inefficient process. Therefore the Rome administration implemented the infrastructure for an automatic access control system that is currently being extended towards an electronic road pricing scheme. The objectives of the access control system are reduction of congestion and modal shift from private towards public transport.

Access to the LTZ is restricted on weekdays from 06:30-18:00h and on Saturdays from 14:00-18:00h. Permission to enter is given free of charge to residents (around 30,000 vehicles) within the LTZ. Other users may obtain permission to move around and park in the area (approximately 90,000 vehicles) if they fall into certain categories such as freight, lorries, doctors with offices in the centre, artisans, etc. The access control system comprises of **24 electronic entry gates and 29 exit gates.**

The cameras set on the poles, detect the plate of vehicles by an Automatic Plate Number Recognition (ANPR) technique, and verifies, if the plate is on the “white list” of authorized vehicles; in case of

violation the fine is automatically issued and finally approved by municipal police officers. The revenues coming from the payment of the annual fee and from violations are used to maintain the system, to recover the environmental externalities and to fund new investments in City public transport services.

No-Vehicle Zone: taken from European Commission's "Reclaiming city streets for people"

Strasbourg's policy of removing cars from its city centre to make way for public transport, buses, new tramlines, cyclists and pedestrians began in 1992, with the implementation of the first '**plan de circulation**'. The plan involved extending the traffic-free precinct in the city centre and banning private car through-traffic; access is restricted to tram, bus, taxi, bicycle and pedestrians.

Two new tramlines have been built using road space previously occupied by car traffic. Predictions of traffic chaos in the city centre, following the removal of through traffic, have not materialized. There has been a significant reduction in the number of vehicles entering the city centre.

In 1990 before the implementation of the strategy, the number of vehicles in the city centre was approximately 2,40,000 vehicles/day. By 2000 this had fallen by more than 16 % to 2,00,000 vehicles per day. Forecasts suggest that had the strategy not been adopted, 3,00,000 vehicles would have been anticipated in the city centre in 2000, i.e. an increase of 25%. This success has been achieved during a period of overall increase in the weight of traffic in the Strasbourg agglomeration as a whole.

"It is not possible to say how much of the traffic has 'evaporated' due to the nature of the data: ***some of the traffic will have been displaced to orbital routes, but a significant volume of traffic has disappeared"***. In addition, the strategy has resulted in an increase in cycling, public transport patronage and park-and-ride use

Freight Delivery in Bristol[28]

The aim of the measure was to create a more sustainable freight solution and reduce movements of delivery vehicles in target areas, to reduce conflicts between daily vehicles and vehicles in loading areas and delivery bays; to improve air quality in the city centre; to help reduce supply chain costs; and to provide an enhanced delivery service for retailers. The freight consolidation scheme was designed to serve retailers in Bristol's core retail area, Broadmead.

The six-month trial involved 20 retailers and possibilities for an ongoing scheme were investigated. The initial step in the development of the consolidation centre was to review the existing freight distribution patterns in Broadmead. In autumn 2003, a survey of retailers in Broadmead was undertaken and a total of 118 surveys were completed using face-to-face interview techniques. The survey data were analyzed to provide a list of retailers fitting the consolidation criteria, who would be invited to participate in the trial.

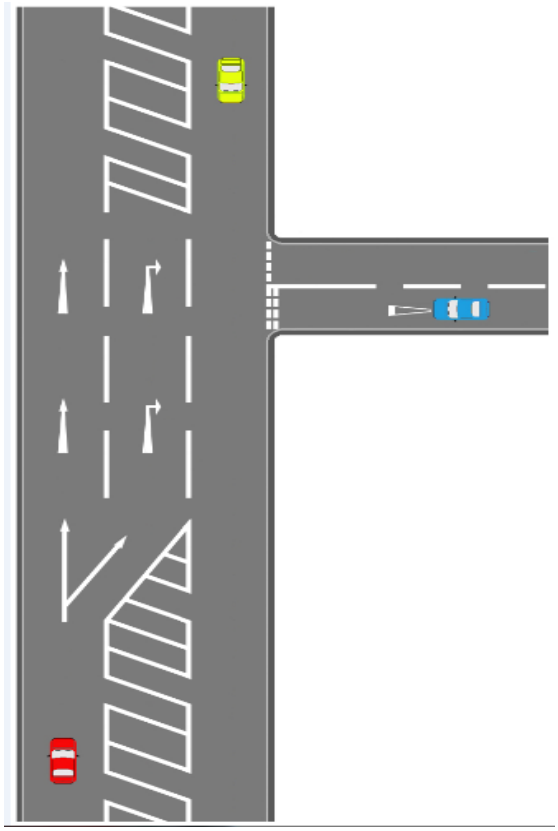
[28] excerpt from civitas-initiative.org/content/freight-consolidation scheme

The recruitment of retailers began in April 2004, with Exel Logistics taking a lead role. The consolidation centre commenced operation in May 2004 with the aim of building up to full capacity over a period of time. The Broadmead freight consolidation centre is located 11 km from the city centre, close to the strategic road network. The scheme was developed with the active support and participation of key local and national stakeholders.

There was a reduction in delivery vehicle movements to participating retailers each month from the beginning of the scheme. From the third month of operation, the percentage of vehicle reduction remained at over 50 percent. This was due to an increase in the number of retailers joining the scheme, with the increased throughput allowing greater use of the available space within the dedicated consolidation centre delivery trips. As a result, a reduction in emissions of CO2, NOx and particulate matter was recorded.

6.3.1.8 Right Turn Filtering Lanes

Intersections are often conflict and bottlenecks points. In many cities one of the key successful measures in improvement of intersections has been to add a lane of traffic reserved for those making a specific turn at the next junction. The systematic direct impact is a material reduction in congestion, thereby indirectly also improving fuel efficiency (GHG) and punctuality. Filtering lanes are also used in roundabouts to organize the traffic and reduce congestion and delays.



Turn lanes at intersections substantially reduce crashes by removing stopped vehicles from through traffic. Research has shown that adding a right-turn lane on one approach of a controlled intersection is predicted to reduce total crashes by 44%. Right-turn lanes also substantially increase the capacity of many roadways. A shared right turn and through lane has about 40 to 60 percent of the capacity of a standard through lane. A synthesis of research on this topic found a 25% increase in capacity, on average, for roadways that added a right-turn lane (as shown in the image)[29].

Free Left Turn Filter Lanes in India

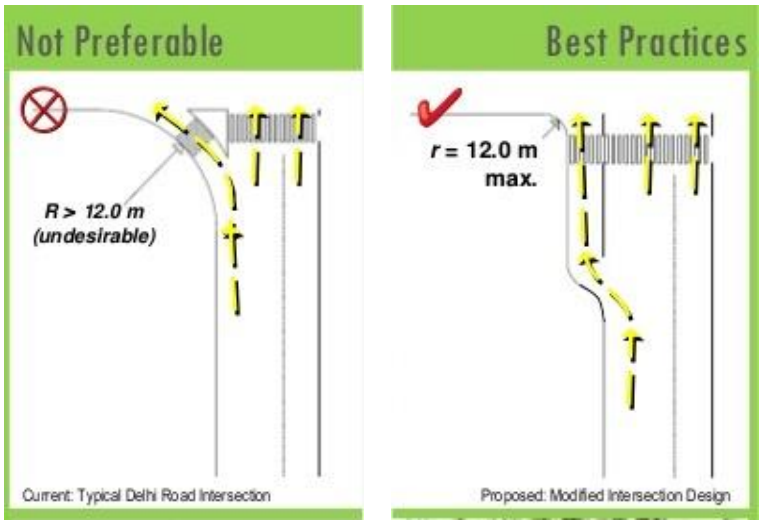
In many cities in India, vehicles are permitted to turn left through a slip road even when the traffic light is red for straight and right turning traffic. Uninterrupted left turns, traffic engineers say, can decongest the crossings to a great extent. That is why cars intending to head straight are supposed to stay off the

[29] http://mobility.tamu.edu/mip/strategies-pdfs/system-modification/technical-summary/Intersection-Turn-Lanes-4-Pg.pdf

last left lane (the left-most lane) while waiting at a traffic signal so that other cars can take a free left turn[30].

Although most people feel that for allowing a free left turn to vehicles, it is necessary to widen roads first – however it can also be done in formal and informal ways of lane demarcation. The lane demarcation can be done either by barriers, cone/ chain, painting, etc. Further, while deciding for provision of free left turn safety of pedestrians, cyclists and other non motorized modes of transportation should also be kept in mind.

During 2010, a study was undertaken by UTTIPEC under "Street Design Guidelines". The UTTIPEC propagates that streets are valuable public spaces as well as movement corridors (as shown in the image). A set of 10 non-negotiable street design components as well as additional guidelines for world class streets were outlined in the documents which has made following suggestions for kerb radius and slip road treatment in case of free left turn filter lanes:



- Slip roads may be replaced by signalized "left turning pockets"
- The turning kerb radii should be made smaller such that the vehicles turning left are forced to slow down, this ensures higher road safety.
- The maximum turning radius "r" allowed in the modified intersection design is 12m with recommended 3.0 for most intersections especially for R/W less than 30m.
- Proper signage should be placed much before left filter lanes for the traffic to re-organize them properly.

However, in India, with the increasing lack of civic sense/ driving discipline, the left filter lanes would be effective only if there are barricades, signages and penalties associated with this.

6.3.1.9 Passenger Friendly Bus Stops

Making bus stops passenger friendly can be achieved by provision of real time information, improved quality shelters, improved accessibility for mobility impaired and provision of multi modal infrastructure such as bike stands, connectivity to multiple modes of transportation.

[30] http://timesofindia.indiatimes.com/city/kolkata/No-left-rule-leaves-roads-choked/articleshow/7789938.cms

The impact of such improvements can lead to increased patronage of public transportation services, due to the improved convenience, understanding of the service, quality and cleanliness for example, and improve the appearance of the local area.

The other aspect of the passenger friendly bus stops require design and architecture know – how to make all weather bus stops which can be utilized equally in Indian summer, winter and rains. Also, they have to be safe and secure from dusk to dawn time and built such that they cannot be replicated as shelters by homeless during night time.

The BRTS bus stops in Ahmedabad with proper ramps can be attributed in this category to a certain extent.

6.3.1.10 Intermodal Travel Information Centre

The center provides door-to-door information for the whole city, including maps with walking connections between stops and final destinations. The center creates t**ransparency about the use of different transport** modes. *(image courtesy: https://us.mytaxi.com/index.html)*

mytaxi

This makes a city more attractive to travel in. A center will make use of other modalities more attractive than the private car because of specific information.

The implementation of such a (physical) center that offers information on tickets on booking opportunities should be linked with a car and bike-sharing station; **switch stations** in Hamburg combine these prerequisites offering -

- an excellent **connection with public transport**
- **integrated tariffs** that include different modes (not all)
- good **information on tariffs and travel opportunities** of different modes (one-way car sharing, car rental, bike sharing, public transport)

Further extension could be a **digital** travel information center, e.g.

- **Qixxit:** shows the best mix of all means of transport**,** tailored to customers individual needs**,** including car sharing, rental cars, cycling
- **Moovel:** Users are able to combine, reserve and book public transport, Car2go, Deutsche Bahn, bike-sharing, mytaxi in one account, in whole Germany through the account
- **Ola App in India:** Users can book car, car share, bus, auto through one mobile app across multiple cities.

6.3.1.11 On-board Bus Travel Information

On-board travel information provides real-time information about the destination and upcoming stops, as well as the weather forecast, news and advertisements. The goal is to improve the user satisfaction. On-board travel information need to be implemented by the transport operator. Aalborg (Denmark), New Delhi & Ahmedabad (India) implemented the system. On-board travel information improves user satisfaction and thus moving pleasure. The real-time information can also be experienced as convenient.

"Aalborg aims to reduce barriers to public transport and enhance the quality of the service. The city tested and implemented therefore on-board travel information on buses. The service displays the destination and upcoming stops, as well as the weather forecast, news and advertisements (as shown in the image)

The 50 buses operating in the CIVITAS ARCHIMEDES corridor were equipped with flat screen monitors, giving the passengers real time information regarding the current trip including the forthcoming bus stops, which routes the passengers can transfer to at these stops and real time information regarding the routes that they may be connecting to. Prior to the implementation of this measure, NT carried out a pilot-project that consisted of installation of flat screens on a selected bus line. Besides the public transport information screens show news, weather information and advertisements. Based on the experiences and user feedback during the pilot, specifications for the on-bus information system were incorporated into the tender for public transport in Aalborg." [31]

On board travel information can be made available by tracking the vehicles through GPS installed on the vehicles, data being sent to a control room and then relevant information being shared with users on the VMS (Visual Message Board) installed on board.

[31] http://www.civitas.eu/content/board-bus-travel-information#sthash.utxtZcJu.dpuf

The control room set up to monitor and track the buses would also help in streamlining bus routes, stop locations, time-tables, seat availability and safety security of passengers on board.

As shown in the image below there are numerous technology and service providers available in the market for this. Images shown below are of Lumiplan[32]

Interior LED displays

Our interior LED signs provide next-stop information, services and buses lines informations, destinations, etc. They rely on the same technology as destination displays and comply with the same standards.

Voice announcement

With the KiBoard on-board computer, both visual information and voice announcements can be delivered simultaneously by following the GPS position of the vehicle. Lumiplan on-board solutions have been designed to be compliant with the disability legislation of most parts of the world.

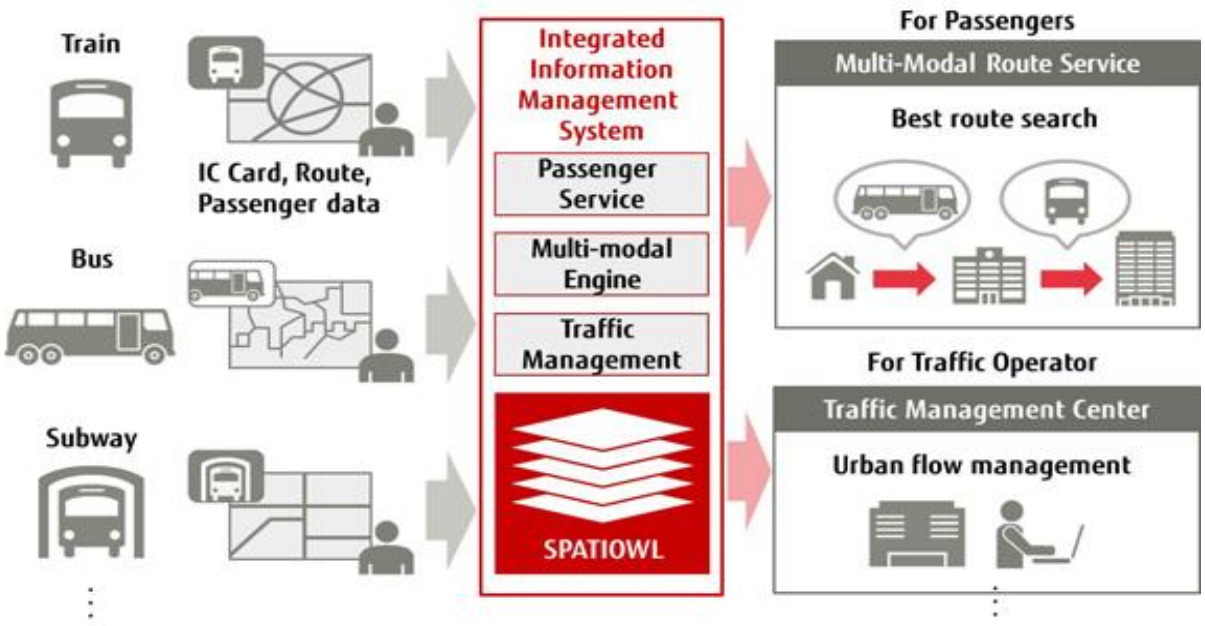


Image courtesy: Fujitsu

[32] http://www.lumiplan.com/en/menu-transport-girouette-afficheur-tft-annonce-sonore

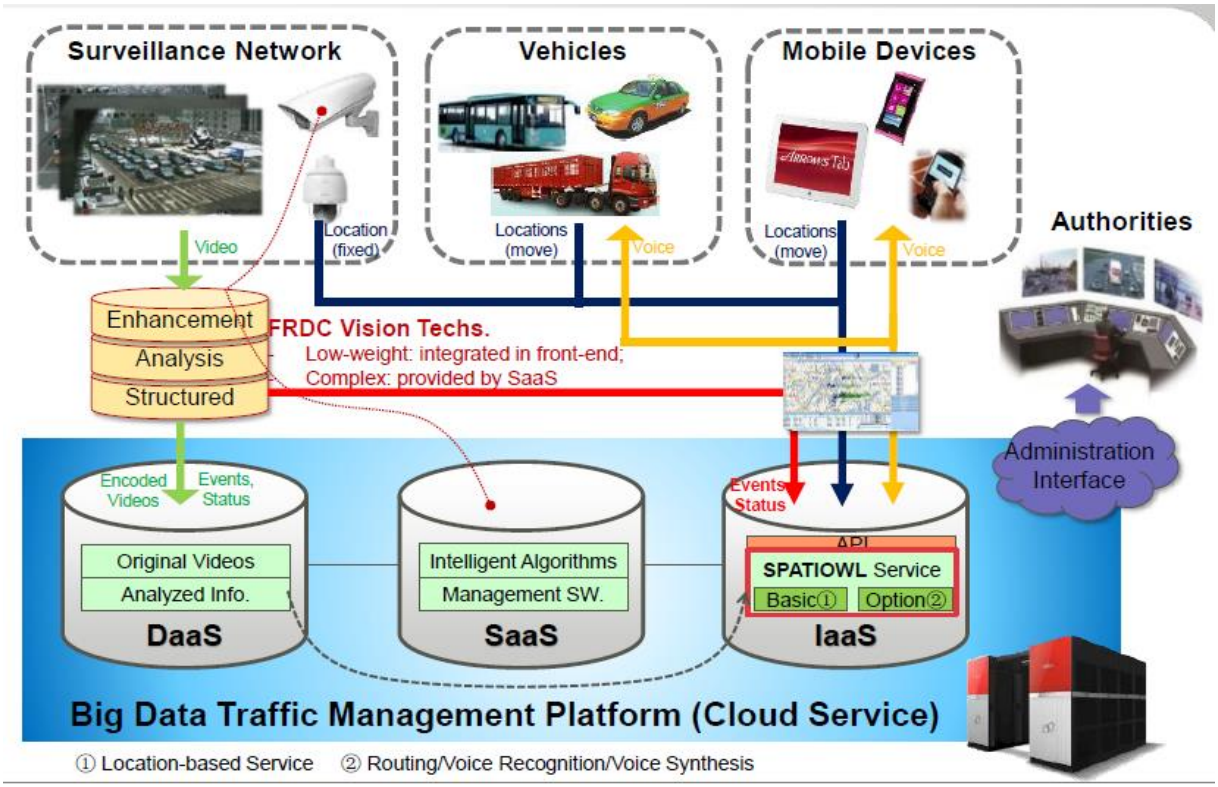


Image courtesy: Fujitsu

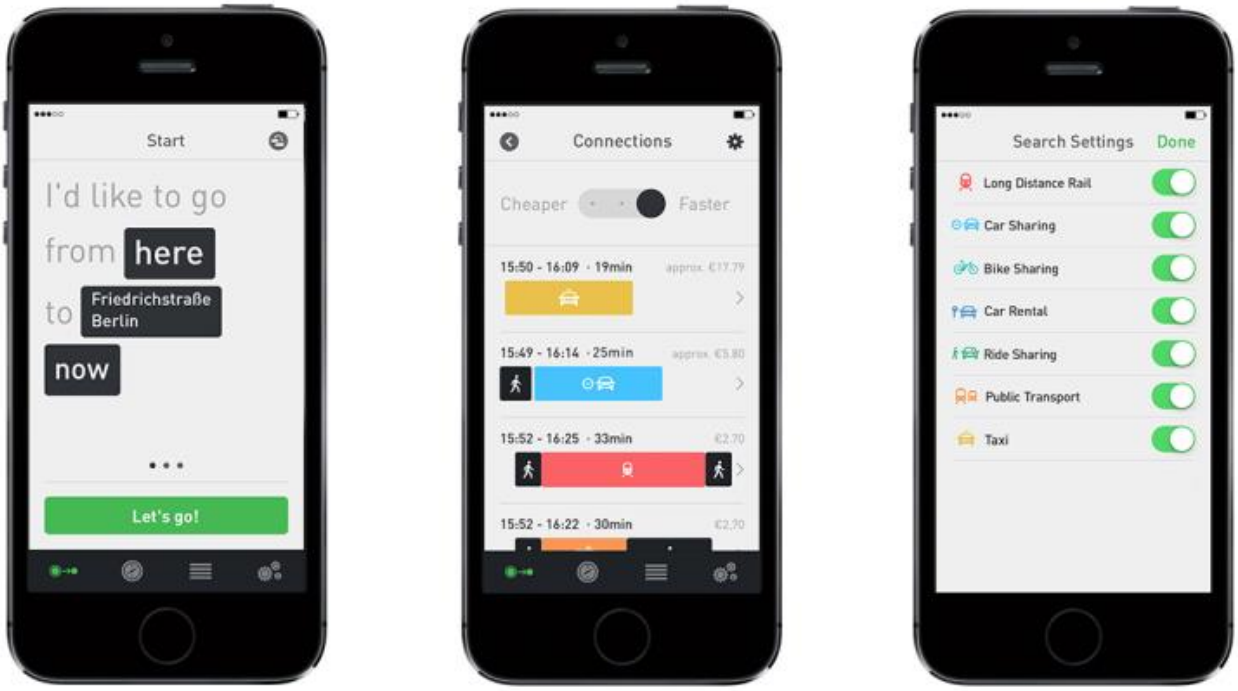
Image courtesy: AiCTSL

6.3.1.12 Multi-modal Real time Information Apps

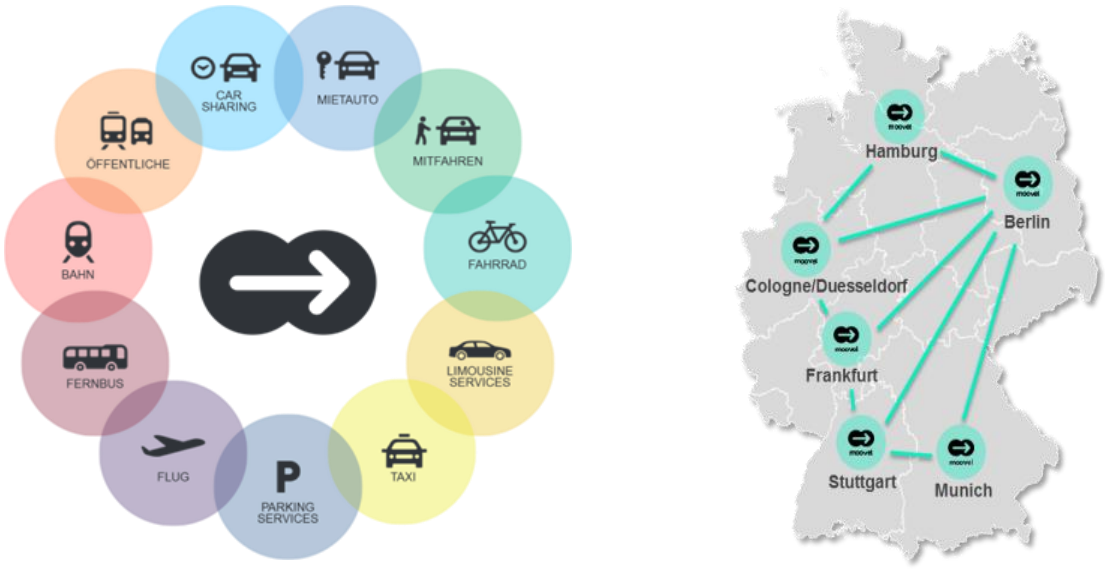
Web and smart-phone based applications encompassing several transportation modes. Advances in connectivity now permit the development of multi-modal transport planning to help people get to their destination in line with their needs (quickest, cheapest) and to be guided on options for changing route in line with traffic congestion. The service bundles offers of different modes including public transportation, taxi, walking, or biking to best move around the urban area

This should be combined with SMART ticketing for multi-modal travel and intermodal connectivity:

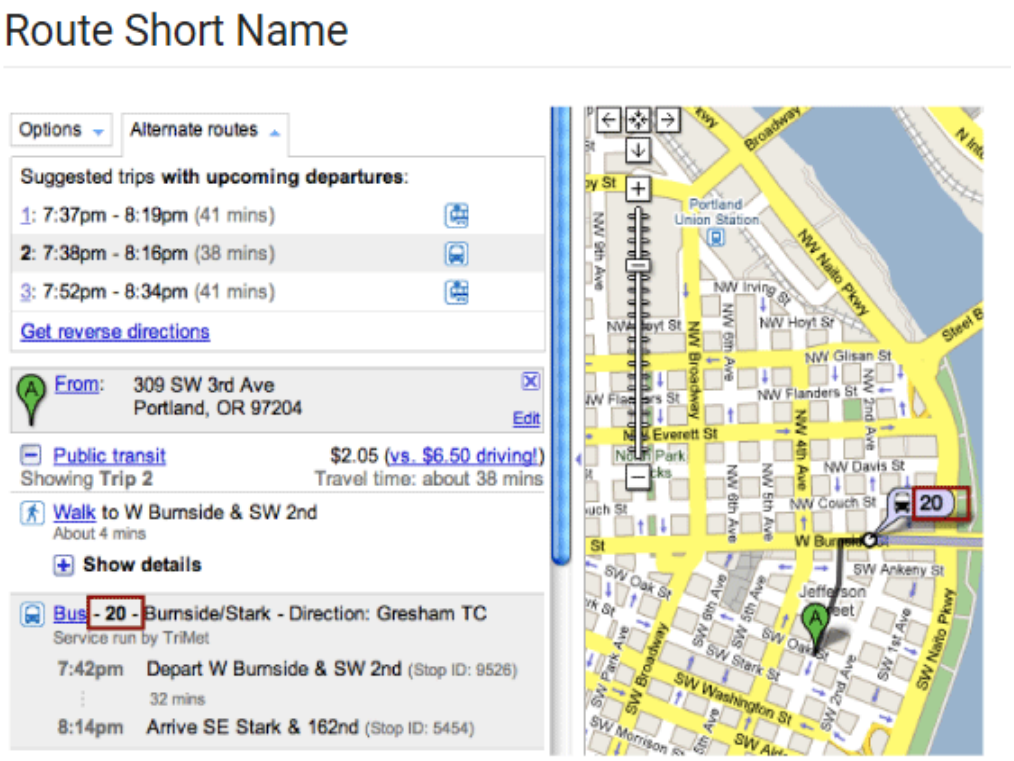
- Auto Rickshaw would be connected with I-Bus.
- With the help of mobile application any passenger can book an auto for pick up (origin to nearest I Bus stop) and drop (nearest bus stop to destination).
- These App not only give access to transport information but also combine many other features like reservations, bookings and payment all in one place
- They also combine different transport modes and services at one place



Also App like Moovel (as shown in the image above and below) in Germany is the future of smart mobility. Seamlessly bringing together car2go, mytaxi, Flinkster, train services, public transport, taxi services, car-shares and bicycle options into one remarkably simple app, Moovel does the hard work for you to get you to where you need to be in the smartest way possible.



Public transit agencies are experts at running large, complex transit networks, but they might have less experience building apps. Google Developers believe that a common format for exchanging public transit information is the solution, so third-party developers can build the innovative transit apps. These formats allow public transit agencies to publish their transit data and developers to write applications that consume that data in an interoperable way. These App also display transit data to users as shown in the image below[33] –



[33] https://www.moovel.com/en/GB

6.3.1.13 Access to Public Transportation for All

This solution is the provision of fully accessible public transport services, for mobility impaired or parents with pushchairs for example. This requires a set of infrastructural requirements in Europe following disability legislation and lobbying, which has led to initiatives and investments such as Network Rail's "Access for All" program in the UK for example[34].

Right to access is a basic right for all human beings. However, sadly in India most places including public places like railway station, bus stands, hospitals, police stations etc also are not constructed in a approachable manner for person with disabilities. District Collector of Gwalior Mr Parikipandla Narahari, felt very strongly against this unjust discrimination and therefore launched a program for a barrier-free Gwalior under the name, **"Nirbadha – Barrier Free Environment"**.

The 'Nirbadha Abhiyan' envisages construction of ramps and putting up Braille signboards at educational institutions, hospitals, government offices, private entities and other public places to facilitate physically challenged and visually challenged persons to move about freely. Under this scheme around 95 percent of the city was made barrier-free.

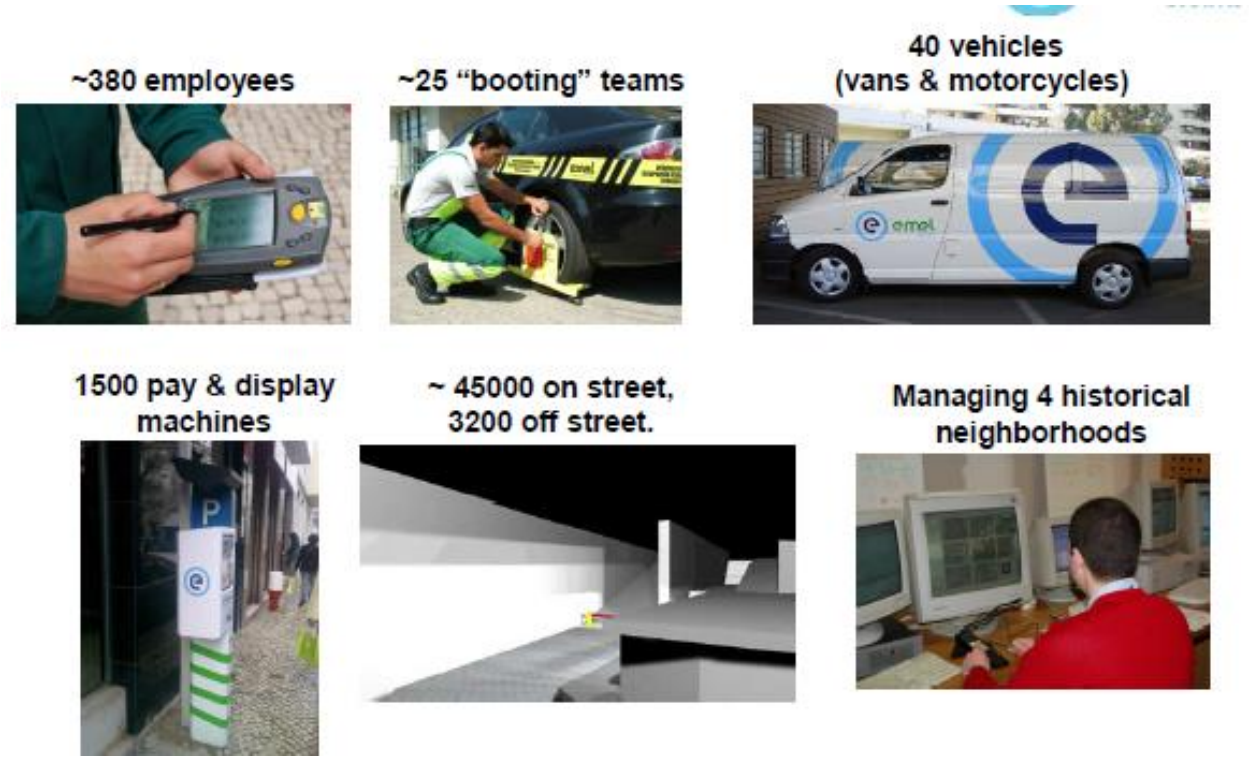
To successfully implement the project, teams comprise of government officials and representatives of NGOs were formulated and tasked to tour the district and submit their reports on difficulty levels of various Government buildings. Based on these reports suggestions were called to improve upon the existing facilities and the team was asked to tour the area again to ensure that the suggestions have been acted upon.

Jutting tiles, Braille sign boards, 900 mm wide passages, 900 to 1200 mm wide entrance and exits, ramps with defined gradient were some of the steps taken under the drive. Mr P Narhari, the chief officer behind the scheme also sent show-cause notice to departments/buildings who did not abide with the project guidelines and did not make buildings accessible to all

[34] http://www.waafa.org.uk/
Image source: https://umasshistory.wordpress.com/page/2/?app-download=ios; http://www.goaccess.co.uk/dda-compliant-ramps-public-access-building/

6.3.1.14 Parking fee enforcement strategy

Parking fees enforcement is carried out by dedicated field forces and assisted by an operation control center. The field forces can warn for low payment, fine, clamp or tow cars depending on the level of infraction and reiteration of the infraction. The area of enforcement is better managed if divided into zones with dedicated enforcement teams. The team includes a manager, one agent for every 450 parking spaces, 1 booting van for ~2,500 spaces and 1 towing car for ~9,000 spaces. The fine prices should be adjusted to the living costs. In Asia they are usually set to 60-90% of the average daily salary, in Europe they are on average 50% of the daily salary *(image courtesy: emel[35])*



There are many companies world-wide that work in the sector of parking fee enforcement. These companies are in some case SPVs formed for city wide parking management or at times private companies being contracted by the local authorizes on yearly/ longer tenders. These companies regulate the parking in areas designated by the authorities, collect fee on behalf of them and as per the fee prescribed by them.

These agencies have manpower, booting teams, vehicles, signages and data analytics also at times to enforce parking fee throughout efficiently.

[35] http://www.emel.pt/pt/

However, for parking fee enforcement to be successful in a city, there have to be clearly established guidelines/ norms issued by the local authorities pertaining to where/not to park, fee, fines, legal action possible, etc. Without these norms or acts being formulated/provided to the service provider, in India especially on-street parking cannot be regulated and managed. Below write up talks about various methods based on which parking fee for a city can be prepared

Parking Management Policies For Travel Demand Management[36]

Parking Management strategies are aimed at encouraging more efficient use of existing parking facilities, reduce parking demand and shift travel to High Occupancy Vehicle (HOV) modes. Smart management of parking helps to ensure access to local businesses, and provides access for visitors to regional and neighborhood attractions without encroachment on valuable public spaces.

ENFORCEMENT – through technological and manual means - is the key to the success of any Parking Strategy. A THREE-TIER Parking Management Framework is proposed for Delhi:

TIER1: Design-based Parking Management Strategies:

- Enforcement aided by design and technology
- Reclaim street space from car parking for other needed public uses such as cycling lanes,
- "Park Once-and-Walk"/ "Park Once" / Shared Parking locations – as per market demand,
- Curb spill over parking impact in residential areas
- Unbundling parking costs
- Park-and-Ride facilities are provided only at terminal MRTS stations or major multimodal interchanges (for smaller terminals people are indirectly encouraged to rely on para transit)

TIER-II: Pricing-based Parking Management Strategies:

- The supply of free or inexpensive parking at the final destination is a key decision factor for people choosing to drive a personal vehicle, rather than taking a bus, cycle-rickshaw, walk or carpool.
- "All public parking locations must be priced by directly linking parking rates to temporal demands, and providing financial incentives and prime parking spaces only to preferred markets such as carpools, vanpools and short-term parkers.

[36] As per The Gazette Notification of India under the Delhi Development Act (page 4), one of the main Aims and Objectives accorded to UTTIPEC (Unified Traffic and Transportation Infrastructure Planning and Engineering Centre) was "To evolve a parking policy and evolve parking solutions". A detailed study was undertaken by Centre for Science and Environment (CSE) and presented to Working Group 3-B of UTTIPEC.

- Variable Time-based Pricing – Differentiation in parking fees can be done according to zone, peak hour demand, weekdays and weekends, etc. by charging higher rates during peak hour, progressive increase in rates per hour. Market based instruments can be used to reduce the impact of high parking rates like mall and shop owners paying for parking and transferring the benefit to their customers etc.

Pricing Model proposed in Delhi's Parking Policy:

The parking policy of Delhi has proposed pricing based on zones:

- Zone A (Epi-Centre NDMC area)
- Zone B (area within Ring Road)
- Zone C (area within Outer Ring Road)
- Zone D (area outside Outer Ring Road)

In addition to above zones, different parts of the city have been coded and categorized broadly in 3 categories:

- Non Congested
- Congested
- Very Congested

A factor for Congestion charges can be levied accordingly for each of the above categories to the parking charges.

The formula for determination of the final parking charges for any parking location is proposed to be:

(Parking Charges of a circle) X (Congestion factor of congestion category) = Parking Charges

This formula is proposed based on NUTP's suggestion of levying high parking fee that represents value of land occupied.

- Coordinated Off-Street and On-Street Pricing (customized to commercial and residential areas). As seen in almost all locations in Delhi where Parking garages exist, the low pricing of on-street parking facilities leads to overcrowding at the curbside and underutilization of off-street parking garages. Therefore, in locations where off-street parking facilities exist, on-street parking should either be priced exponentially high with time, or prohibited altogether for ease of enforcement.

TIER-III: TOD-based Parking Management Strategies:

- Provide parking caps in TOD Zones based on public transport accessibility level (PTAL) and/or distance from MRTS Stations.
- This is in addition to the overall pricing criteria to be implemented as part of Tier-II Strategies.
- Substantially replace ECS with cycle, para-transport and HOV parking in high PTAL zones
- Cycle and HOV Parking to be mandated as part of ECS requirements.

- Enlist non-permissible uses within the TOD zones.
- Car-dependent and non-ridership generating uses to be prohibited within the 500m influence zone

Few more provisions of parking policies from different cities:

- Delhi's parking policy also has provision that private land owners shall be provided with license for allowing development of parking facility. This will have necessary waiver of municipal taxes and other incentives like capital subsidy as it is an infrastructure.
- Bangalore parking policy has made additional provision for variable parking fee based on size and type of vehicle-the larger the vehicle, the fee will be higher along with variable pricing based on zones, time and duration
- BMC has proposed charging motorists based on business of the area where the plot falls, the average revenue it generates from a particular slot and timing of parking. Commercial complexes, corporate and government offices, etc will be put in 'A' category — the parking rate proposed is Rs60 per hour. In 'B' and 'C' categories – less busy compared to A category - the rates will be Rs40 and Rs20 per hour, respectively. The present per hour rate is Rs20.

6.3.1.15 Smart Ticketing systems

An Automated Fare Collection (AFC) system allowing users to seamlessly transfer from one transport mode to another without the need for purchasing ticket/s in advance or paying for separate journeys. It is an automated revenue collection system which facilitates purchase of pre-paid tickets and their subsequent use through electronic systems to permit access to or from the transport mode. AFCS reduces on-board ticketing, helps in easy accounting of revenue collection and generates rich information for MIS purposes. In addition, AFC reduces the need for ticket checking staff and helps prevent fraud.

The AFCS typically comprises of the following main sub-systems:

- On-bus Sub-system
- Depot Sub-system
- Central Operations Center (COC) Sub-system

- VPN (Virtual Private Network) Sub-system
- Single-ride/ Multiple-ride Ticketing Sub-system
- Revenue Collection and Protection Sub-system

(image courtesy[37])

Card vending machine

Card readers in yellow

What are Electronic Ticketing Machines?

Electronic Ticketing Machines or ETMs are new generation automated ticketing machines that can manage numerous fare structures and ticket types. They are small, light-weight, handheld devices, that are used by conductors to print and issue tickets. ETMs make the whole process of issuing tickets easy and convenient. They also reduce the risk of any fraudulent practices and facilitate rich MIS.

Key benefit indicators include quicker transfer times, typically cheaper fares for the end-user and greater levels of convenience and flexibility. The successful implementation of schemes such as the Oyster card system in London will see further expansion of AFC systems worldwide. Some mobility cards also offers car-sharing and bike rental next to the regular mobility card services.

Europe's largest premium car service Addison Lee has now launched its API allowing customers, partners, and affiliates the ability to integrate Addison Lee booking and related services into any website or application. The new Open API service will allow partner or affiliates to integrate a range of Addison Lee Services into their websites or apps which as well as booking functionality will also include the ability to offer payments, generate upfront price quotes before booking and allow for upfront journey time quotes too.[38]

London Oyster Card

London in 2003 introduced Smart Cards known as "Oyster Card". One can use an Oyster card to travel on bus, Tube, tram, DLR, London Over ground, TFL Rail and most national rail services in London.

Passengers touch the oyster card on an electronic reader when entering and leaving the transport system in order to validate it or deduct funds. Cards may be "topped-up" by recurring payment authority, by online purchase, at credit card terminals or by cash. The card is designed to reduce the number of transactions at ticket offices and the number of paper tickets. Usage is encouraged by offering substantially cheaper fares than with cash though the acceptance of cash is being phased out. On London buses, cash is no longer accepted.

[37] http://metro.co.uk/2011/02/28/3-6m-london-travellers-fined-for-oyster-card-errors-641757/

[38] http://www.connectedcar-news.com/news/2015/aug/17/addison-lee-launches-open-api-allow-third-parties-integrate-its-services/

Special Features Of London Oyster Card

- These are electronic stored value
- Works on Radio Frequency Identification (RFId) technique
- Contactless radio transmitter in each card

Project benefits

- Seamless movement for multimodal trips
- Around 43 mn cards issued till June 2013 (3 times of metro population of the city)
- Speeds up boarding on PT modes, resulting in less waiting time for passengers accounts for >80% of journeys on Public Transport in London

These are more efficient because:

- These can be used across almost all modes of transportation in the city like bus, tube, tram, DLR, London over ground and some river boat services and some National Rail services in London
- Equally preferred option for citizens and tourists
- Can be easily purchased online/at street corners, etc

The RFID system was bolted on to existing magnetic system

- Additional cost of Rs Rs 2,400 Cr (€300mn) to set up
- Works at proximity range of 80 mm (3 inches)

Via Verde Toll Collection System[39]

Via Verde (literally "Green Lane") is an electronic toll collection system used in Portugal since 1991. It is available at all toll roads and bridges in the country since 1995. It was the first to be universally applied to all the tolls in a country.

Upon passing in a non-stop lane at a toll, a DSRC tag attached to the vehicle's windshield transmits its identifier and the toll amount is debited directly from the client's bank account. If an exception is detected (the tag is invalid (or non-existent) or the vehicle's class (as detected by the lane sensors) does not correspond to the class encoded in the tag, amongst others) the vehicle is photographed and, if there is indication of fraud, a legal procedure is initiated. This system provides for a good flow of traffic, usually the non-stop lanes on interchanges have a 40 or 60 km/h speed limit, tolls on the highway (as in between different tolling regions) have a 120 km/h speed limit, and the system has been proven to work at speeds above 200 km/h (which are

[39] https://www.viaverde.pt/

obviously unsafe, especially on narrow non-stop lanes). In order to deduct fare at toll plazas vehicles have been categorized into different classes based on their height which is measured vertically from the first axis.

Delhi Smart Ticketing Systems

Govt. of NCT of Delhi (GNCTD) has nominated DIMTS as the nodal agency for implementing the Automatic Fare Collection System (AFCS) Project. The Project consists of designing, developing, implementing, operating and maintaining and facility management of Automatic Fare Collection System and value added services based on smart cards which will be acceptable in multiple travel modes including DTC buses, private buses, metro rail, Light Rail Transit, Mono Rail and value added services like parking, taxis, auto-rickshaws, etc. As part of the Automatic Fare Collection System (AFCS) project, DIMTS has developed customized Electronic Ticketing Machines for the first phase of the AFCS project.

The ETMs offered by DIMTS are not just ticket-stub printing machines, as in conventional ETM solutions, but smart card enabled devices with inbuilt GPRS modules. The system is designed to transfer data from ETMs directly to the central server without being connected to the computers at the depots. The ETMs are also capable of validating smart card passes and doing transactions on smart cards. DIMTS' ETM System is a stepping stone for a larger Automatic Fare Collection System (AFCS) project. Thus the ETM devices, its application and backend application have been designed keeping in view, the requirements of a typical AFCS. Special features of ETM devices:

- A secure point-of-sale terminal that has been manufactured to meet the banking requirement and adapted to meet the transport requirements.
- Ready for use for contactless smart cards passes and e-purse smart cards
- Can store up to 800 routes, 5,000 bus stops data, more than 5,000 transactions in its memory
- Light weight, ergonomic design

The total number of buses to be covered in the AFC System and equipped with on-bus sub-systems will be approximately 11,000. The system will also have to be deployed in all bus depots.

The proposed AFC system will be suitable for stage-based fare structure and will accommodate various types of existing passes/tickets. In addition, it is proposed that the AFC System be flexible enough to cater to other possible fare structures/ ticketing options including flat fare, time-based fare (peak and off-peak differential fare), free transfers among various modes, etc[40].

[40] www.dimts.in (text and images)

Delhi Metro Card

Delhi Metro tokens and cards have an NFC (Near Field Communication) tag inside which allows the exit machines to read/write data on it. NFC is a technology that allows two devices to communicate with each other when brought in proximity or touched. The sensor on the exit machine works on electromagnetic induction to transmit data, and the technology principle is called RFId (Radio Frequency Identification). The cards and the tokens use AES encryption (Advanced Encryption Standard).

An encryption key is generated each time an interaction takes place to prevent other NFC enabled devices from accessing data. Every Metro station has the 'Station Code'. The key is encrypted with station code on the chip/token/card at the entry gate and again decrypted at the exit gate. The calculated distances from each station are already fed into the machine. After decryption, it shows the change of balance which is left. The exit gate matches the station codes, collects the data of money to be deducted from your card, encrypts it again, and simultaneously shows it on the screen.

Integrated Fare Collection system of Delhi Metro with Rapid Metro for seamless travel - The fare collection system of Rapid Metro (Gurgaon) has been integrated with the fare collection system of Delhi Metro for the convenience of the travelling public. The smart card users can travel seamlessly with their existing smart cards between both the systems as the DMRC smart card is valid on the rapid metro system also.

Online recharge of the smart card is also possible through credit cards, debit cards, net banking, e-wallet, etc [41]-

[41] Delhimetrorail.com (text and images)

More Delhi Cards

In December 2011, the Ministry of Urban Development had announced the launch of a nationwide interoperable transport card. As a first step, the "More Delhi" card was to be introduced by the Delhi Metro. Next step preparations are also underway to integrate Delhi Metro's card with DTC buses. The step is a move towards integrating various modes of transport in the city in order to facilitate seamless travel in the capital.

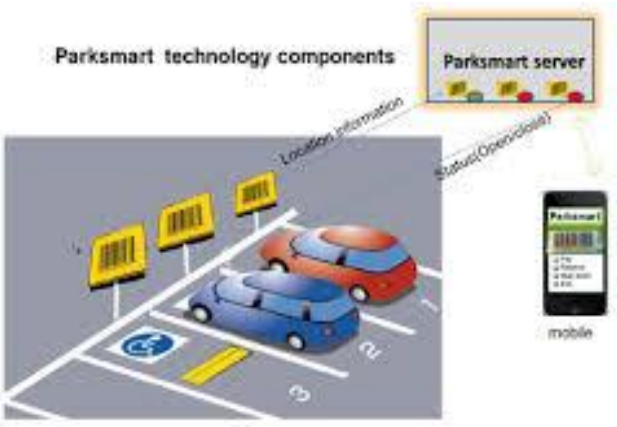
Cluster buses will also be included in the scheme. The Delhi Transport Corporation is expected to procure electronic ticketing machines (ETMs) for its buses, which will accept the More Delhi card of DMRC. DMRC will make changes to its smart card so that it can be used on DTC buses. The common mobility card would initially be recharged at DMRC's automated fare recharge booths inside Metro stations and DTC pass counters. But eventually, a system will be put in place that will allow people to recharge the cards in other utility stores based on their bar codes.

6.3.1.16 Smart Parking

Smart parking can be categorized in two categories mainly –

- Mechanized parking –
    - Type 1 - Single stack, multiple stack, roller
    - Type 2 - Vehicle lifts with zero manual intervention
- Semi/ fully automatic parking –

- Equipped with some or all systems for Parking management and guidance like boom, sensor, camera, license plate recognition, etc
- Equipped with online technology for users to locate, book and pre-pay for the parking slot.



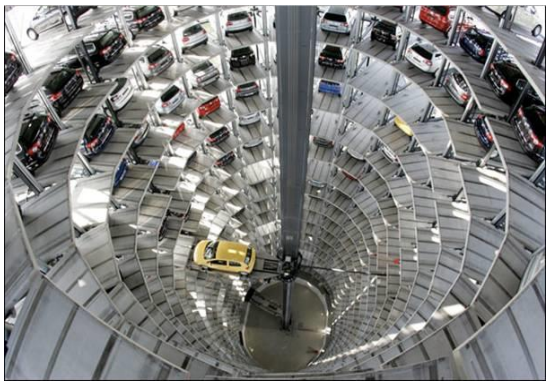
The mechanized car parking (MCP) is a system designed to minimize the area required for parking cars. The technology utilizes a mechanical system to transport cars to and from parking spaces in order to eliminate much of the space wasted in a multi-story parking garage. All MCP take advantage of a common concept to decrease the area of parking spaces - removing the driver and passengers from the car before it is parked. The driver uses an automated terminal nearby for payment and receipt of a ticket. When driver and passengers have left the entry area, the mechanical system lifts the car and transports it to a pre-determined parking space in the system. The driver retrieves a car by inserting a ticket or code into an automated terminal. The APS lifts the car from its parking space and delivers it to an exit area.

Fully automated MCP theoretically eliminates the need for parking attendants. Semi-automated APS also use a mechanical system of some type to move a car to its parking space, however putting the car into and/or the operation of the system requires some action by an attendant or the driver.

Type 1[42]

Type 1

[42] Photo have been used for indicative purposes and the credit goes to individual photo owners



Type 2

Type 2

The next level of parking is the semi or fully automated parking systems where technology to find, book and pay a parking space at a destination facility is available.

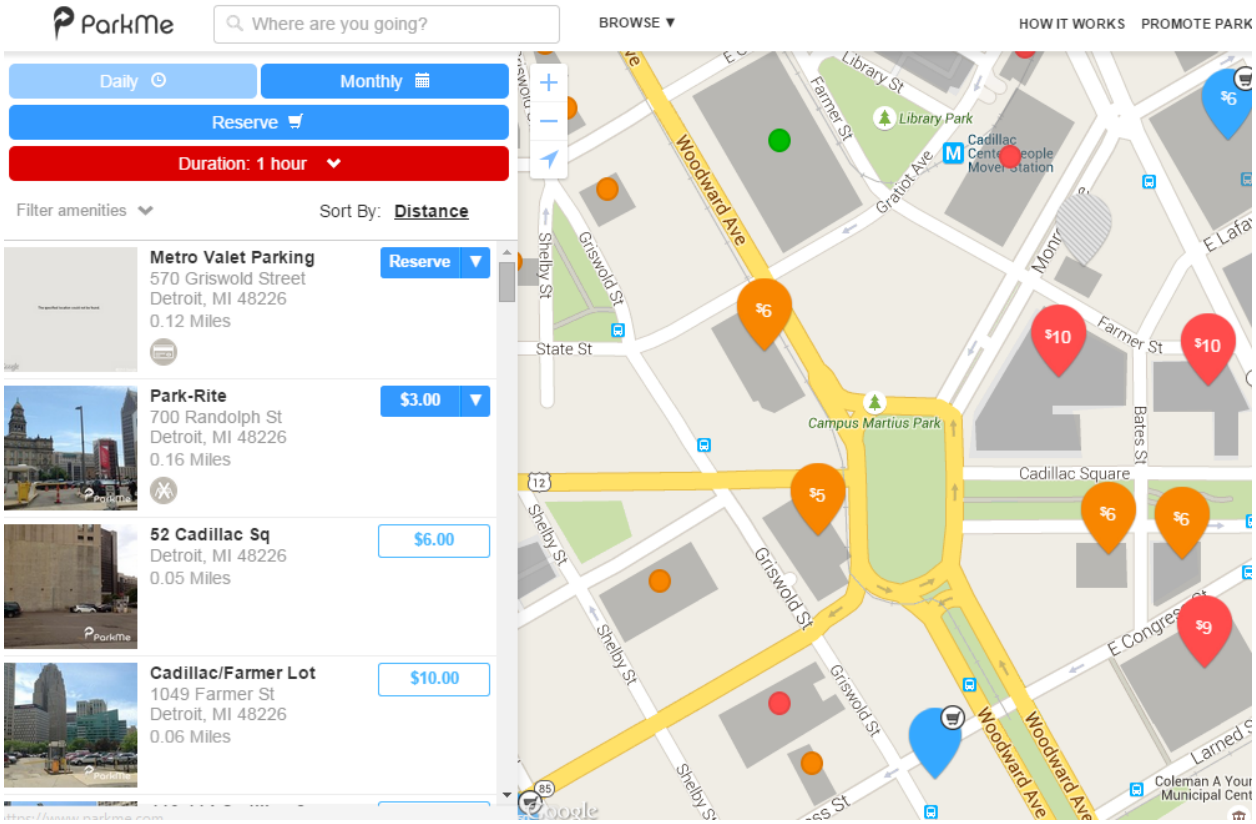
As an active parking management solution it requires an instantaneous data platform to collate the information and then the infrastructure to communicate it to travelers. This platform can be designed such that it also provides traffic information about the surrounding areas to inform of delays, jams and closed roads to the users. This solution can have a positive impact on localized traffic flow and increase efficiency of the journey, consequently decreasing traffic demand (reduced congestion) and maximizing transportation as a whole. The measure would certainly reduce stress on the driver and ensure the process of accessing the city and parking is quicker and easier.

Once at/inside the parking lot with help of these fully/semi automated parking management and parking guidance systems the user can enter the parking lot without manual intervention, the car license plate and movement is recorded, the user can make cashless payments at the pay stations with smart card/RFID tag/QR codes etc. These systems also help the user identify the availability at the start of the parking and also find empty slots at each floor with help of a blinking light, have sensors to locate the car while retrieving and many more of such advanced facilities.

HOW TO USE Parkmobile

HOW IT WORKS

1. Look for the Parkmobile sign or sticker.
2. Once registered, use the Parkmobile app to enter in the zone number listed on the sign to start a parking session.
3. ***That's it!*** And just to make life easier, you can opt-in to receive a notification 15 minutes before your parking session is set to expire.



How does SMART parking help -

- Minimize costs per transaction:
- Maximize registrations: < violations
- Reduce operational costs: < ANPR inspections
- Minimize costs road side equipment

How does it do all the above -

- By saving time in the process and giving sure availability of a slot
- By making registration easy through RFID tag, mobile parking;
- By providing high quality of services
- Big data analysis for optimizing enforcement

Value added services are seen as **critical for success on customer acquisition**:

- Forecasting free parking lots enables to develop unique services;
- Guided parking

Concrete proposal/application of the solution in Hamburg

- Divide the city in **testing parking areas** and define # parking lots
- For each area # permits are known
- Identify existing **enforcement systems applicable** (mobile License Plate Recognition (LPR); fixed LPR cameras; enforcement agents) and **data available**;
- Based on LPR scanning, an algorithm which calculates the actual presence of cars can be developed.
- Learning algorithm.
- For each area number of sold tickets (mobile; local) is known – integrated data.
- Based on this information a number of expected free spaces per area can be calculated. Accuracy will improve during time.

6.3.1.17 Street Vending

Creation of vending zones in Bhubaneswar is a unique case which witnessed collaboration of public, private and community organizations for building a market which works exclusively for the urban poor (Street Vendors). B.M.C along with National Association of Street Vendors of India (NASVI) conducted the joint survey, Government of Orissa provided the land and an advertising agency build the shops in return of securing advertising rights over it. The vendors also invested in the construction of aesthetic vending kiosks. The necessary funds were disbursed by S.B.I in form of loans.

A strong scene of Vendors' Union Movement made it possible to involve the Municipal Corporation and the State Government in taking up the task of creation of 52 vending zones as of date and allocating licenses to above 2,000 vendors, thus benefitting about 11,000 family members of the street vendors. It also benefitted BMC in improving city's transport and its beautification.

Initial stage

- The land disbursed for vending zone belongs to Government of Orissa (G.A Department). It took several rounds of negotiations and advocacy for getting the land sanctioned from G.A Department for vending zone.

- A vendor who conducted business in an area was allocated the zone within that space itself i.e. care taken to create vending zones in the natural markets. In case of inevitable relocation, areas not far away were given. New vending zones were created in prime areas too.

Transition stage

- After sanctioning of vending zones, the vendors were allowed to construct temporary sheds of recycled bamboo products as designed by the civic body.

- Upon successful functioning for six months, they were allowed to convert the shed into non-concrete iron structures.

End result

- The process of constructing iron sheds was done through an advertisement agency on PPP mode, which was given the right to use the defined displayed space for commercial use.

- A joint venture called Public Private Partnership Parking (PPPP), that works for the rest of the city was given the charge to manage the parking around the vending zone. Around 39 parking slots are functioning out of which 27 is through PPPP. This new parking management enables the vehicles to be parked along the roads in disciplined manner. It prevents the traffic chaos and ensures hassle free shopping for the customers[43].

[43] Randhir Kumar and Arbind Singh (2009), Empowering the Street Vendors in Changing Indian Cities-A Case Study of Bhubaneswar (Orissa)

Payables

- It is interesting to note that neither the Government Authority nor the BMC charge the vendors any rents for the shops. The vendors only pay a fixed trade license fee of Rs 500 annually. Further to reduce its work load and increase the collection efficiency BMC has appointed an external agency Nikhil Utkal Khyudra Byabasayee Mahasangha (NKUBM), to collect this fee.[44]

- B.M.C drive for clean and green Bhubaneswar got a major boost with the formation of vending zone. B.M.C won IATO award for city beautification drives on 09/08/2008. On April 11, 2007 B.M.C was rated 5th cleanest city (among 18 capital cities) of India by a survey conducted by AC Nelson.

Lessons Learned

- B.M.C got a legal way of earning revenue in form of distributing trade license.
- Vendors: The new market thus developed improved their business
- Due to their status of legality, there is neither the instance of large sums going into bribes, nor the fear of eviction.
- Customers are happy with the upcoming of the vending zone concept as it is more organized and clean.

[44] www.urbanodisha.gov.in

7. The Roadmap

The Indore SMP2.0 team was re-energized by the multiple successful interactions with the stakeholders and the positive feedback from the pilot projects. They were highly motivated to begin development of the Roadmap for the implementation of prioritized solution list.

Inspired by tremendous response of the stakeholders during the WBCSD SMP2.0 process the city administration independently initiated multiple projects across various facets of urban mobility to improve the quality of services -

1. **Safety:**
    a) GPS in public Transport: including all city buses, few autos and magi vans
    b) Initiation of pink auto: The auto that will be run by lady auto drivers
    c) CCTV camera in all buses including intercity buses
    d) CCTV camera near 56 Dukan, Sarafa, Lasudia and at other major intersections
    e) BRTS bollards to avoid the entering of other vehicles in BRTS lane and for safety of public

2. **Travel Time:**
    a) Synchronization of signals
    b) Traffic warden are deployed at junctions
    c) BRTS operation extended up to Rau circle

3. **Congestion:**
    a) Enforcement by traffic department with announcement on moving vehicles
    b) Continuous assessment of alternative routes/ roads and development plan
    c) Instruction to education institutes to operate during non-peak hours

4. **Intermodal Connectivity:**
    a) Tele Rickshaw in operation
    b) iRide in operation (Rental Two wheeler)
    c) iBike is in preliminary stage

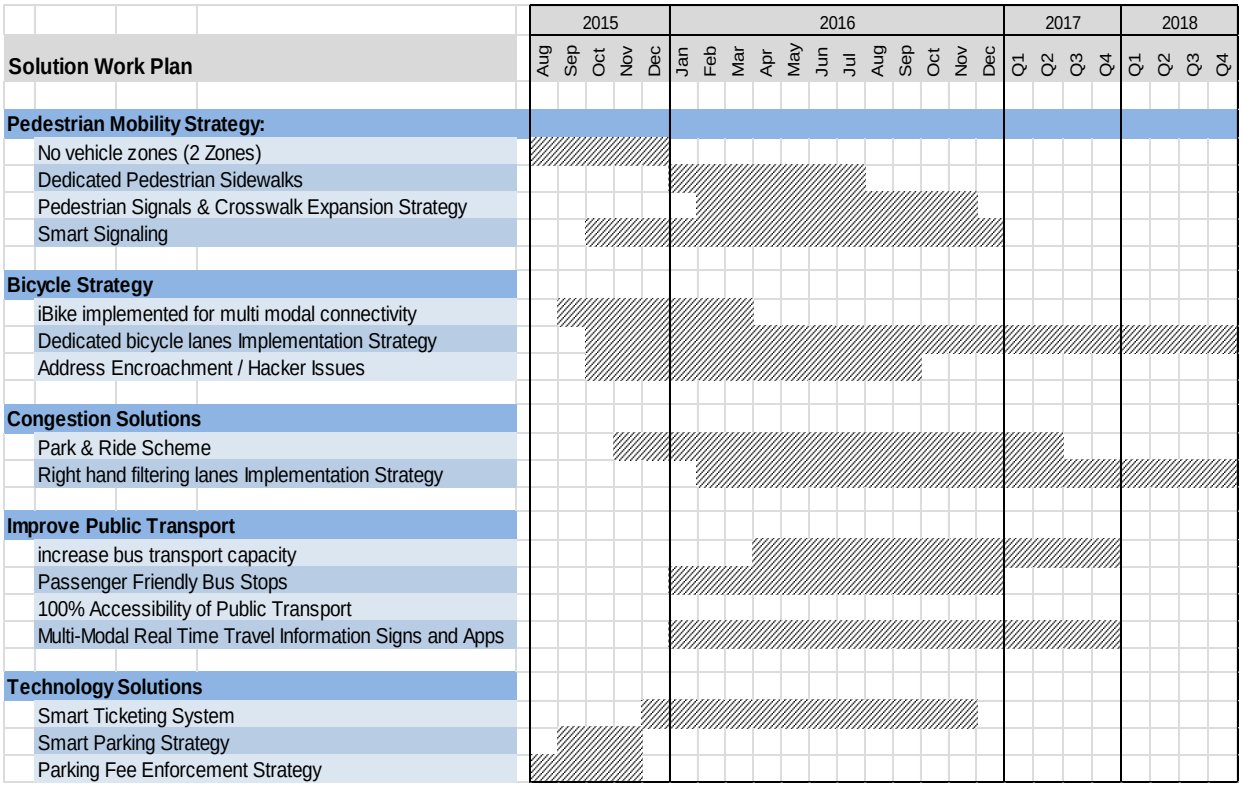
5. **Quality of Public Area:**
    a) IMC is working on housekeeping
    b) Development of river side corridor by IMC
    c) Development of various areas with public opinion / surveys (Sarafa)
    d) Free Wi-Fi facilities to all iBus travelers
    e) Vending Machine and ATM installed in public areas

6. **Inclusive Access:**
    a) Ramp on BRTS (iBus) stations
    b) Concessional city bus passes

7. **Access to Mobility Services:**
    a) Rationalization of city bus routes and standardization of bus terminals
    b) New routes identified to reach mass public
    c) Feeder routes are started like Bichouli/Rau/Silicon city

7.1 Solution Roadmap

The roadmap for sustainable mobility in Indore comprehensively considers the priority solutions, the lessons learned from the pilot projects and the enablers developed during the stakeholder dialogue and core team meetings. The SMP2.0 roadmap is a document which outlines the plan but can also be enhanced with new solutions and action items as appropriate. The roadmap with proposed timelines has been shown in the image below -



1) No Vehicle zones to be implemented – Target January 2016 onwards

- Conduct a survey to understand how to reduce congestion in the area enclosed by Rajwada area, Jawahar Marg, Netaji Subhash Marg, Nagar Nigam Road
- Parking plan of the area (guideline: within the 1.5km stretch) for 2 wheelers, 4 wheelers, auto rickshaw stands to be identified
- Expand existing area of no vehicle zone with barriers & signs
- Conduct awareness campaign and install clear visible Signs to indicate rules and install barriers to mark the expanded zone

- Strategize a one way road network
- Define commercial delivery time limited to 2 hours of non-peak hours
- Vehicle parking at the arterial roads for heavy vehicles (delivery time adherence)
- For delivery outside the time limit enforce use of **logistics hub (located as per Master Plan)**
- Develop a vendor (hawker) zone strategy

2) Park & Ride scheme – Target December 2017 onwards

- Investigate state & central government funding policy for parking garage (JNNURM, Amrut, DUTF)
- Investigate Bangkok example where shop owners fund the capital and then give discount to parking fee if the parking user shop in their store
- Investigate appropriate fees if the street parking is free or not enforced
- Determine planned locations with good public transport connectivity: many were suggested from mapping exercise
- Investigate a 2 tier bus system "**executive bus**" with amenities similar to private car
- Investigate a "low cost" bus route or timetable or a reduced fare with low income card
- Indore policy for large corporations and institutions to incorporate corporate shuttle bus

6/14/2015 The Free Press Journal - Indore Edition, 13 Jun 2015 :DigitalEdition

Now, take a BRTS bus to Mhow

AICTSL governing body clears proposal to to integrate tickets with taxi service

• OUR STAFF REPORTER
Indore

The Atal Indore City Transport Services Limited (AITCSL) is ready to extend the operation of its AC bus service, i-bus, upto Mhow.

Presently, the bus operation is restricted only upto Rau.

A decision to this effect was taken at a meeting of AICTSL governing body on Friday.

AICTSL PRO Mala Thakur told Free Press that it was decided that the operation of i-buses will be extended up to Mhow from Rau. It would be achieved within a week.

District collector P Narahari inspecting City Buses in Indore on Saturday. FP PHOTO

"But the BRTS railings would not be extended up to Mhow," she said.

Integrated ticketing system soon

The intercity and interstate bus operator also decided to implement the integrated ticketing system.

Under the new system, after purchasing a rechargeable smart card, a commuter can call the taxi home and also get BRTS bus service.

A passenger would not have to purchase the ticket for Bhopal, Burhanpur, Alirajpur or any other destination, separately.

IMC/IDA given repairing work

The governing body also decided to hand over responsibility of repairing of BRTS railings, traffic signals, roads and the squares to IDA and IMC.

The paintings on the railings and zebra crossing will be conducted by IMC. The targets should be achieved in 15 days.

The issues like income-expenditure, operation of interstate buses, tender for 65 small buses were also discussed.

The depot for the sky buses will be formed at Rajiv Gandhi Square, Scheme no. 78, Vijay Nagar square-based RTO office.

Collector P Narahari instructed RTO officials to shift their belongings to New RTO building at Nayta Mundla.

AICTSL will also start operation for Makdon, Hoshangabad, Sendhwa and Surat in short future.

Tele-auto gaining popularity

AICTSL CEO Sandeep Soni said that the tele-rickshaws are gaining popularity.

With a single call, the rickshaw approaches the commuter's home or office. The income of the owners of the tele rickshaws have increased by 25%, he said.

So far over 200 auto owners have enrolled under the system and another 200 wants to enlist.

Soni said that the AICSL is going to launch a simple android mobile application, through which the passengers can book the tickets from home-office.

The meeting was attended b IMC commissioner Manish Singh, ADM Deepak Singh and ARTO RK Bamania.

3) Technology Solutions – Target December 2017 onwards

- Smart Ticketing System: Single mobility card required for multi-modes of public and private public transportation mode
- Smart Parking: All new parking lots should be SMART parking - new policy required.
- Parking Fee Enforcement Strategy: Insure common policy for parking eligibility and fees; parking fee enforcement to be implemented; implement E-challan (e-ticket with the camera)

4) Improve Public Transport

- Increase bus transport capacity: more city buses and more Tata Magic vans required with appropriate quality

- Official training and licensing program for all public transit drivers: professional demeanor, safe driving practice, standards for vehicle maintenance
- Use Para transit as feeder option to integrate with BRT with co-ordinated schedules and availability
- Enhance passenger friendly bus stops: Implement standard design bus stop and station with weather shelter, amenities, internet connectivity, cleanliness
- 100% Accessibility of Public Transport: Insure standard design policy includes flat entry platform and ramp access to station
- Intermodal Travel Information, On-Board Bus Travel Information and Multi-Modal Real Time Information Apps

5) Improved Pedestrian and Bicycle Mobility

- Dedicated Pedestrian Sidewalks: Insure that sidewalks meet IRC guidelines
- Pedestrian signals & crosswalk
- Smart Signaling: Define the rules for pedestrian crossings & logic of signaling (privilege for Pedestrians before vehicles)
- Implementation of iBike per AiCTSL plan: confirm the car parking and/or bus station at the iBike stations for intermodal connectivity
- Dedicated bicycle lanes: clear markings for all bike lanes and enforcement

During the stakeholder discussion the CTF team also suggested that the Roadmap is an evolving document that can be further adapted to the new technological advancements and learning's as the city continues its path towards improved sustainable mobility.

7.2 Monitoring and Implementation Mechanism

The Steering Committee has taken the decision to formulate a committee for each of the different solutions. These committees will oversee, track and ensure formulation of detailed project reports and implementation measures for flawless execution of these solution -

- Parking Plans / zones
- No Vehicle Zones
- Park & Ride
- Hawker zone / management
- Pedestrian signal infrastructure

Suggested Committee Members

- ADM
- Addl. Commissioner, IMC
- ASP, Traffic
- AICTSL
- RTO
- Department of Town & Country Planning

- IMC & IDA
- Technical Experts (GSITS, IIM)
- Public Representatives

7.3 Barriers and Enablers

All the stakeholders including the CTF team acknowledged that implementation of the solutions will not be without challenges. The SMP2.0 process anticipates potential challenges and offers suggestions in 4 categories: **Behavior, Policy, Finance and Infrastructure**. Each of these have been detailed in the table and sections below -

	Behavior	Policy	Finance	Infrastructure
Bicycle Sharing				
• **Enforcement of bicycle lanes**	Perception of bicycle sharing	Enforcement of bicycle lanes		
• **Perception of bicycle sharing**		Enforcement		
• **Implementation and Ownership**		Enforcement	No money	No space
Right Hand Lane Filtering				Special holding box for motorbikes at the start of the junctions with separate traffic light for them.
Park and Ride		Multi-zoned – residential and commercial		Not enough space for parking

Congestion	Will 2 wheelers respect a no vehicle zone? Car-free zones - duration No vehicle zones? No lane discipline Civic sense and traffic sense	Does the “no vehicle zone” include 2 wheelers? For what duration? One way for roads less wide than 40 feet		Encroachment Providing facilities to transit from parking lots to central city Need better signals and better roads Need proper road marking
Intermodal Connectivity	Too much waiting time – not convenient			
	Why all new infrastructure?	Encroachment and land misuse Not utilizing resources		
		Training public transport drivers		

		No policies to boost development of peri-urban areas to alleviate pressure in the city center Does policy consider population growth? Policy needs to plan for anticipated needs	Funding anticipated needs	No infrastructure connecting outlying villages/future suburbs

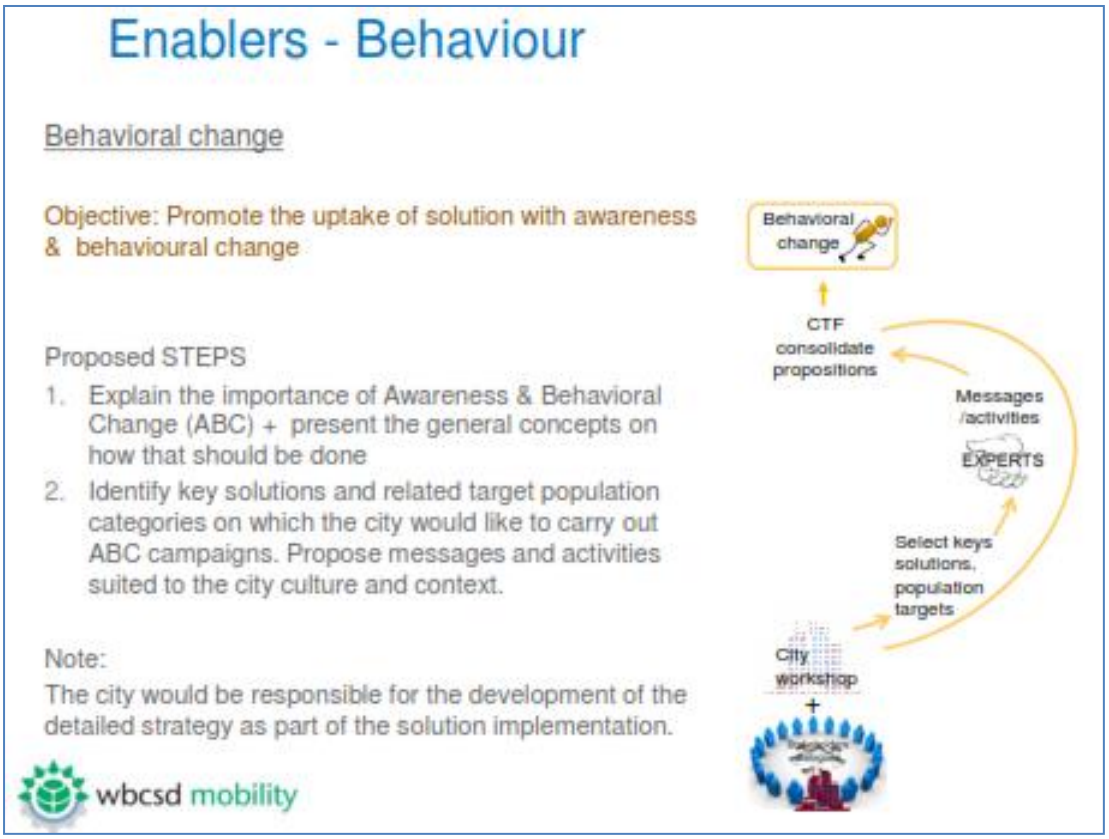
7.3.1 Behavior Enablers:

During the city meeting on 29-July-2015, the CTF team conducted a workshop to identify the "5-Why's" associated with the behavioral pattern of the citizens. Behavioral challenges. The WBCSD team worked with the city and identified the behaviors such as encroachment, lack of lane discipline, parking violations, etc that are the root cause of various mobility issues in the city.

In the session potential remedies to these causes were also identified and incorporated in the roadmap.

The key learning's from that session have been summarized below -

- Most people do not follow traffic rules (parking, lane discipline, etc.) due to poor enforcement, lack of education on traffic rules, loopholes in issuing the driving license, lack of punishment for default.
- Encroachment on footpaths by vendors is due to lack of Infrastructure, enforcement and proper hawking zones etc.
- Most people are hesitant to use public transport due to lack of intermodal connectivity, non-adherence to schedule by vehicles, behavioral issues of drivers, safety and comfort concerns and absence of last mile connectivity etc.



7.3.2 Policy

During the stakeholders dialogue, the core team discussed the potential Policy and Infrastructure measures to enable implementation of the solutions and brainstormed Enablers to overcome the barriers.

The primary barriers to overcome include:

- Encroachment of footpaths
- Lack of respect and discipline for pedestrian sidewalks and dedicated bicycle lanes
- Unavailability of parking in designated zones; lack of parking space and sign boards
- Funding for setting up user-friendly bus stops
- Enforcement of parking rules and collection of penalties from defaulters

7.3.3 Finance

WBCSD had commissioned PwC to develop a list of funding mechanisms used by cities from around the world. Further, this list was related to solution categories in the Solution Toolbox. A list of the many funding mechanisms aligned with the Indore priority solutions was provided to AiCTSL for Indore's usage. Indore already has experience in demonstrated use of PPP and few other creative funding mechanisms.

Indore will also explore State and Central grants as well as PPP and corporate sponsorship (CSR) funding as means of implementing these Roadmap activities.

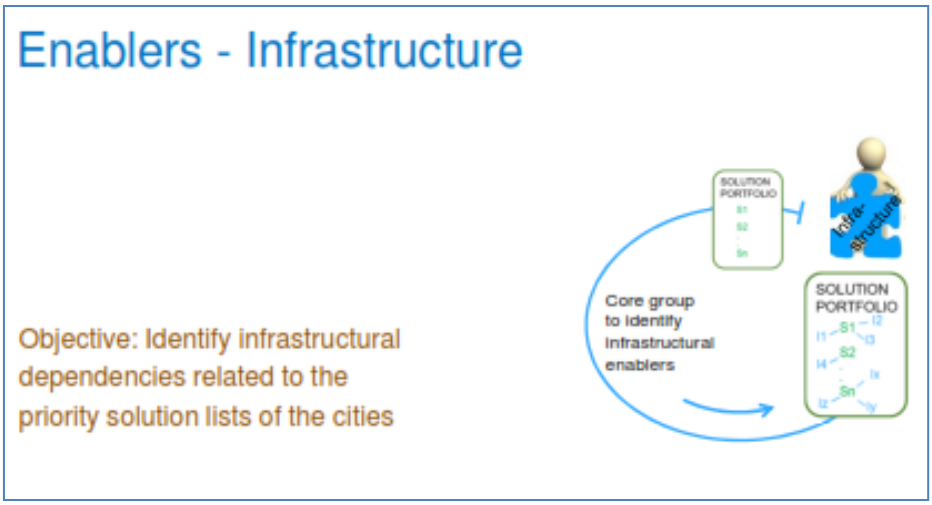
1. To set up an individual entity or consult with an agency for advertisement rights. Which will access and suggest the respective department about the advertisement amount, below which the department should not accept the bid
2. Allow extra FAR (floor area ratio) to generate the extra revenue
3. Give the rights to third party agency to maintain the bus stops with world class amenities. In response to that agency will have the entire space for advertisement
4. Seek the public participation to fund for city's development
5. Built up the upcoming places on PPP model

Category	Sub-category	Sub Sub Category	City Driven? (Yes, No	Potential Source of Funds	Potential Mechanism Category
Asset sharing	Public Bicycles	Cycle Hire	Yes	Project Generated Cash Flows City Operations Private Sector Institutions and Investors	Project Generated Cash Flows: Farebox City Operations: Taxes and Fees, Debt, Grants, Value Capture Private Sector Institutions and Investors: Debt, PPP
Clean fuels and vehicles	Clean fuels and sustainable infrastructure	Sustainable Traffic Signals	Yes	City Operations Private Sector Institutions and Investors	City Operations: Taxes and Fees, Grants Private Sector Institutions and Investors: Donation, PPP
Collective passenger transport	Ticketing and tariffs	Ticketing	Yes	Project Generated Cash Flows City Operations Private Sector Institutions and Investors	Project Generated Cash Flows: Farebox, Value Capture City Operations: Taxes and Fees, Grants Private Sector Institutions and Investors: Donation, Debt, PPP
Collective passenger transport	Intermodality	Intermodal integration	Yes	Project Generated Cash Flows City Operations National and Subnational Government Development Assistance Institutions Private Sector Institutions and Investors	Project Generated Cash Flows: Farebox, Value Capture City Operations: Taxes and Fees, Grants, Debt National and Subnational Government: Grant, Debt Development Assistance Institutions: Grants, Flexible Support Private Sector Institutions and Investors: Equity, Debt, PPP
Collective passenger transport	Intermodality	Park & Ride	Yes	Project Generated Cash Flows City Operations Development Assistance Institutions Private Sector Institutions and Investors	Project Generated Cash Flows: Farebox, Value Capture City Operations: Taxes and Fees, Debt Grants, Value Capture Development Assistance Institutions: Grants, Flexible Support Private Sector Institutions and Investors: Debt, PPP, Donation
Collective passenger transport	Public Transport offer and accessibility	Accessible Transport	Yes	Project Generated Cash Flows City Operations National and Subnational Government Development Assistance Institutions	Project Generated Cash Flows: Farebox City Operations: City Operations: Taxes and Fees, Debt, Grants National and Subnational Government: Grants, Debt Development Assistance Institutions: Grants, Debt, Flexible Funding Support
Collective passenger transport	Public Transport offer and accessibility	Underground/Metro Rail	Yes	City Operations National and Subnational Government Development Assistance Institutions Private Sector Institutions and Investors	Project Generated Cash Flows: Farebox City Operations: Taxes and Fees, Debt, Grants, Value Capture National and Subnational Government: Grants, Debt Development Assistance Institutions: Grants, Debt Private Sector Institutions and Investors: Equity, PPP, Debt
Collective passenger transport	Service Improvements	Public Transport Improvements & Priority	Yes	Project Generated Cash Flows City Operations	Project Generated Cash Flows: Farebox, Value Capture, Value Add City Operations: Taxes and Fees, Debt, Incentives for Private Investment
Collective passenger transport	Ticketing and tariffs	Pricing strategies	Yes	Project Generated Cash Flows City Operations Private Sector Institutions and Investors	Project Generated Cash Flows: Farebox City Operations: Taxes and Fees, Grants, Incentives for Private Investment Private Sector Institutions and Investors: PPP
Demand management strategies	Access and capacity management	Intersections Management	Yes	City Operations National and Subnational Government Development Assistance Institutions Private Sector Institutions and Investors	City Operations: Taxes and Fees, Debt National and Subnational Government: Taxes and Fees, Debt Development Assistance Institutions: Grants, Debt Private Sector Institutions and Investors: Debt, PPP
Demand management strategies	Parking management and pricing	Parking Reservation and payment	Yes	Project Generated Cash Flows City Operations Private Sector Institutions and Investors	Project Generated Cash Flows: Farebox City Operations: Taxes and Fees, Incentives for Private Investment Private Sector Institutions and Investors: PPP
Demand management strategies	Parking management and pricing	Parking scheme	Yes	Project Generated Cash Flows City Operations Private Sector Institutions and Investors	Project Generated Cash Flows: Farebox City Operations: Taxes and Fees, Incentives for Private Investment Private Sector Institutions and Investors: PPP
Demand management strategies	Parking management and pricing	Parking tariffs	Yes	Project Generated Cash Flows City Operations Private Sector Institutions and Investors	Project Generated Cash Flows: Farebox City Operations: Taxes and Fees Private Sector Institutions and Investors: PPP
Demand management strategies	Walking and cycling enhancements	Bicycle strategy plan	Yes	City Operations Development Assistance Institutions	City Operations: Taxes and Fees, Value Capture Development Assistance Institutions: Grants
Demand management strategies	Parking management and pricing	Automated Parking system	No	City Operations National and Subnational Government Private Sector Institutions and Investors	City Operations: Incentives for Private Investment National and Subnational Government: Incentives for Private Investment Private Sector Institutions and Investors: Equity
Safety and security	Safer roads, bike and foot paths	Bicycle lanes	Yes	City Operations	City Operations: Taxes and Fees, Debt, Grants, Value Capture
Safety and security	Safer roads, bike and foot paths	Route planner for bicycles	Yes	City Operations Private Sector Institutions and Investors	City Operations: Taxes and Fees, Grants Private Sector Institutions and Investors: PPP
Safety and security	Safer roads, bike and foot paths	Safe City Access For Pedestrians	Yes	City Operations	City Operations: Taxes and Fees, Grants, Value Capture
Transport telematics	Data & Traffic Management Systems	Integrated mobility services platform	No	City Operations National and Subnational Government Private Sector Institutions and Investors	City Operations: Incentives for Private Investment National and Subnational Government: Incentives for Private Investment Private Sector Institutions and Investors: Equity
Transport telematics	ITS-based enhancement of public transport	Taxi Booking	No	City Operations National and Subnational Government Private Sector Institutions and Investors	City Operations: Incentives for Private Investment, Grants National and Subnational Government: Incentives for Private Investment Private Sector Institutions and Investors: Equity
Transport telematics	Road-User information	Integrated real time information platform	Yes	Project Generated Cash Flows City Operations National and Subnational Government Private Sector Institutions and Investors	Project Generated Cash Flows: Farebox City Operations: Taxes and Fees, Grants, Debt National and Subnational Government: Taxes and Fees, Grants Private Sector Institutions and Investors: PPP, Debt
Urban freight logistics	Distribution schemes	Aggregated Logistics booking Platform	No	City Operations National and Subnational Government Private Sector Institutions and Investors	City Operations: Incentives for Private Investment National and Subnational Government: Incentives for Private Investment Private Sector Institutions and Investors: Equity
Urban freight logistics	Distribution schemes	Bike Couriers	No	City Operations National and Subnational Government Private Sector Institutions and Investors	City Operations: Incentives for Private Investment National and Subnational Government: Incentives for Private Investment Private Sector Institutions and Investors: Equity

7.3.4 Infrastructure

There is a dire need of developing better infrastructure in the city to complete various activities detailed as part of the roadmap. This infrastructure ranges from soft to hard and from temporary to permanent.

Without development of these infrastructure features like - providing facilities to transit from parking lots to central city, better signals and better roads, proper road marking, signage, hawking facilities, technology (IT) infrastructure required for smart signals/smart parking would be a must to fulfill all the activities listed under the roadmap.



Further, development of infrastructure would need all the other enablers in place. The policy pertaining to the initiative prepared, approved and implemented. The funding required for it identified and the behavior or citizen perception towards creation of that infrastructure being supportive – only then can the City build its infrastructure and use it efficiently for ages to come.

8. Next Steps

Process lessons (for Indore)

- Indore is expected to implement the solutions identified in the roadmap with modifications as required
- The initial proposal from the CTF included a total of 34 potential solutions. As part of the roadmap only 15 solutions have been detailed, however, the city officials can consider the remaining 19 solutions as part of a longer term plan to address mobility challenges in the city.
- Indore can maintain the data in the Indicator Analysis spreadsheet to reflect and update the ongoing progress of the solutions recommended as part of the roadmap.
- Indore has been selected as one of India's 100 Smart Cities. The smart city project is Prime Minister Narendra Modi's ambitious plan aimed at recasting the urban landscape of the country by making cities more livable and inclusive, while driving the economic growth. Great benefit can be derived by seeking convergence of other Central and State Government Programs/Schemes with the Smart Cities Mission. The SMP2.0 solution implementation plan can be used to compliment goals of the Smart City initiative.

Process lessons (for other cities)

- The project methodology begins with the mobility issues prioritized by the city and works towards integrated solutions, rather than bringing isolated solutions to the city to address perceived issues
- The project brings together businesses from several sectors to work with the city to develop an holistic approach to urban mobility, rather than businesses propagating isolated solutions.
- The stakeholder dialogues conducted at each step are instrumental in the formulation of the roadmap for the implementation of the solutions

9. Annexure

9.1 Press Release

Mobility Plan based on WBCSD study to be presented in October

• OUR STAFF REPORTER
INDORE

The World Business Council for Sustainable Development (WBCSD) has announced that it will present a comprehensive city mobility plan in October. After studying present mobility system minutely, it has suggested 5-point plan for its improvement.

On the concluding day of 2-day workshop of WBCSD at Hotel Radisson Blu on Wednesday, a meeting of the steering committee of Indore Project held. Collector P Narahari, ADM Deepak Singh, CEO of AICSTL Sandeep Soni, Director of WBCSD Michael Fahy and officials of the police department were present.

WBCSD's 5 points programme to ease traffic

In the meet, while presenting his suggestion for improvement in traffic systems, Fahy said: "On the basis of our study, we come out with a draft mobility plan including a roadmap for model planning for the city.

Collector Narahari said in Indore there are 650 vehicles for 1000 people, which is highest in the country. A citizen who has one two-wheeler or a car, purchase another 2-wheeler or a car instead of using. He agreed that the WBCSD suggestions will provide us direction.

City prioritized solutions suggested by WBCSD

1. **Integrated Cycling with public transport**
The agency has emphasized on using sharing bikes. It means there should be stalls of bicycles and bikes that should be used to catch the public transport from nearest stop. There should be dedicated bicycle lanes.
2. **Pedestrian mobility**
There must be enough space for pedestrian mobility, like footpath, zebra crossing with due signaling.
3. **Congestion Solution**
In order to avoid the congestion of vehicles in the city, the park and ride scheme should be promoted. The vehicles coming from other city should be parked outside the city and people should move in the city using public transport. Right turn filtering lanes, means the vehicles want to turn on right ride should come to the right side lane while driving.
4. **Improve Public Transport**
There should be people friendly bus stops, intermodal travel information, on board bus travel information, multi model real time information Apps, and 100% accessibility of public transport.
5. **Automatic payment**
There should be smart ticketing system, means a passenger should be given facility to purchase one ticket for the means and it should be through the cards.

Suggestions are viable

After the steering committee meeting, Collector P Narahari said that suggestions are achievable and the problems which will arise will be sorted out with help of people and public representatives. But, improvement in the mobility is the need of hour. WBCSD has shown us the direction.

9.2 Member Companies of SMP2.0

Through the development of the SMP2.0 process and the interaction with cities, new opportunities for businesses to drive the urban sustainability agenda forward will develop. This has benefits for the whole of the cities as well as for private sector, including the members of this project. The objective, as with all WBCSD programs, has been to accelerate business solutions for a sustainable world – a world in which nine billion people can live well, and within the planet's resources, by the year 2050.

This mobility project in Indore takes place in the broader context of WBCSD in India, where WBCSD are engaged with the cities of Jaipur, Bangalore and Navi Mumbai on projects with business around buildings and energy systems. The experience in Indore is a powerful, perhaps unique example in terms of quality and focus, of businesses collaborating with an Indian city in a strategic way to improve the wellbeing, comfort and quality of life of its inhabitants

Indore CTF Member Companies:

Perspective of the member companies

Ford Motor Company – "Changing times are creating exciting new opportunities for our business. At Ford, we're not just about making vehicles. We're focused on innovative, sustainable solutions for future global mobility. Ranked among the 10 fastest-growing cities in India, Indore offers the perfect recipe for gridlock. The population has reached 2.4 million residents, outpacing transportation infrastructure development and leaving busy roadways choked with a crowded mix of buses, trucks, motorcycles, cars, rickshaws, carts and pedestrians.

Engaging with Indore to understand the challenges their city faces has proven informative and rewarding to date. We tested and improved the WBCSD Sustainable Mobility Processes in a real-world environment. We've built a relationship that promises to continue mutual learning and ultimately pilot and implement tangible mobility solutions. These are important steps on our journey to remain relevant through changing times, and contribute to creating a better world."

Feedback Brisa Highways P Ltd *(goes by the brand name Ezeeway)* – Brisa in India, through its subsidiary FBH is into operations and maintenance related services for transportation sector like the highways, MRTS, smart parking, urban mobility initiatives, etc. Both JV partners in FBH i.e Feedback Infra and Brisa are leading service providers in infrastructure space with deep understanding of the transportation and related sector. We believe that the growth in infrastructure sector would be driven by tier 2 and 3 cities in India and thus, engaging with Indore was primarily to understand the key issues & challenges faced typically by a tier-2 city and also to contribute to "India shining" by sharing our experience and expertise with the city.

9.3 Toolbox

Toolbox provided potential solutions for Indore consideration (November 17, 2014 meeting):

9.3.1 Initiatives to be taken up in next 1 year

SolutionName	Safety	Congestion and delays	Access to mobility	Intermodal flexibility	Access for deficiency	Quality of public area	Travel time	City Impact
Workplace car sharing	0	0	3	0	1	0	0	4
Bike-sharing	0	2	2	2	0	1	2	9
Solar-powered flashing warnings	2	0	0	0	0	0	0	2
Shuttle buses to the business district	0	3	2	1	2	0	2	10
Bus Rapid Transit	2	1	0	0	2	1	2	8
Dedicated company shuttle bus	1	2	1	2	1	0	2	9
Bus Only Lane	0	2	0	0	0	0	2	4
Mobile NFC Ticket Payment	0	0	0	3	0	0	1	4
Smart Card	0	0	0	3	0	0	1	4
SMS Ticket Payment	0	0	0	3	0	0	0	3
Limit loading/unloading times	0	2	0	0	0	1	1	4
Introducing time-controlled access restrictions	2	-1	0	0	1	3	0	5
Strolling zones	2	-1	0	0	1	3	0	5
Zone-model parking system in the city centre	0	2	0	0	0	0	0	2
Integrated bicycle strategy plan	2	2	0	1	0	1	2	8
Dedicated bicycle lanes	2	1	0	0	0	0	2	5
Visual displays at pedestrian crossings	3	0	0	0	0	0	0	3
Reduced Speed Zones	3	1	0	0	0	1	0	5
Traffic Surveillance At Selected Main Road Intersections	2	1	0	0	0	0	1	4

9.3.2 Initiatives to be taken up in 2 - 5 years

SolutionName	Safety	Congestion and delays	Access to mobility	Intermodal flexibility	Access for deficiency	Quality of public area	Commuting travel time	City Impact
Dynamic Ridesharing	0	2	1	0	1	0	1	5
Telematic real time tire management	2	0	0	0	0	0	0	2
Microdistribution	0	1	0	0	0	0	1	2
Integrating cycling and public transport	1	0	0	3	0	0	1	5
Intermodal travel information centre	0	1	0	3	0	0	1	5
Park and Ride Scheme	1	3	0	3	0	0	0	7
Urban Development Along Bus Corridors	0	0	2	1	0	0	1	4
Public transport and soft-mobility corridor	2	-1	0	0	1	3	0	5
Passenger-friendly bus and tram stops	0	1	0	2	2	2	1	8
Public transport priority at intersections	0	2	0	0	0	0	2	4
Tire solutions for public transport	2	0	0	0	0	0	0	2
Multimodal e-ticketing system	0	0	0	3	0	0	2	5
Roadside Ticket Vending Machine	0	1	0	0	0	0	2	3
Right or left turn filtering lane installation at intersection	0	3	0	0	0	0	3	6
Parking fees enforcement strategy	0	0	0	0	0	1	0	1
IT-Based Event-Oriented Traffic Management	2	2	0	2	0	0	1	7
Green arteries	1	0	1	1	0	3	0	6
Traffic simulation model	0	3	0	0	0	0	2	5
Bicycle Paths	2	1	0	0	0	0	2	5
Route Planner For Bicycles	2	0	0	0	0	0	2	4
Social mobility platform	0	0	1	0	2	0	0	3
Adaptive Traffic Signal Control	0	2	0	0	0	0	0	2
Dynamic Traffic Management	1	3	0	2	0	0	3	9
Public Transport Control And Guidance System	0	1	0	2	0	0	2	5
Incident management systems for public transport	1	2	0	1	0	0	0	4
Real time online traffic information	1	2	0	1	0	0	2	6
On-board bus travel information	0	0	0	3	0	0	2	5
Real-time displays for bus arrival time at bus stops	0	0	0	2	0	0	2	4
Multimodal real-time information apps	0	2	0	3	0	0	2	7
Urban Consolidation Centre (UCC)	1	2	0	0	0	0	2	5
Commercial Vehicle Fleet Management	2	1	0	0	0	0	2	5

9.3.3 Initiatives to be taken up in 5+ years

SolutionName	Safety	Congestion and delays	Access to mobility services	Intermodal flexibility	Access for deficiency groups	Quality of public area	Travel time	City Impact
100% accessibility of public transport	0	0	0	0	3	0	0	3
Proximity services at major passenger transport hubs	0	1	0	3	1	2	2	9
Automated Parking system	0	0	0	0	1	0	0	1
Smart parking	0	3	0	0	0	0	2	5
Water Highways	1	2	0	0	0	0	2	5
Automatic traffic incident detection	3	1	0	0	0	0	0	4
Monitoring Centre for road safety and accident prevention	3	1	0	0	0	0	0	4
License plate recognition and enforcement	1	0	0	0	0	0	0	1
Semi-autonomous electric vehicle for public transportation	2	2	0	2	0	0	1	7

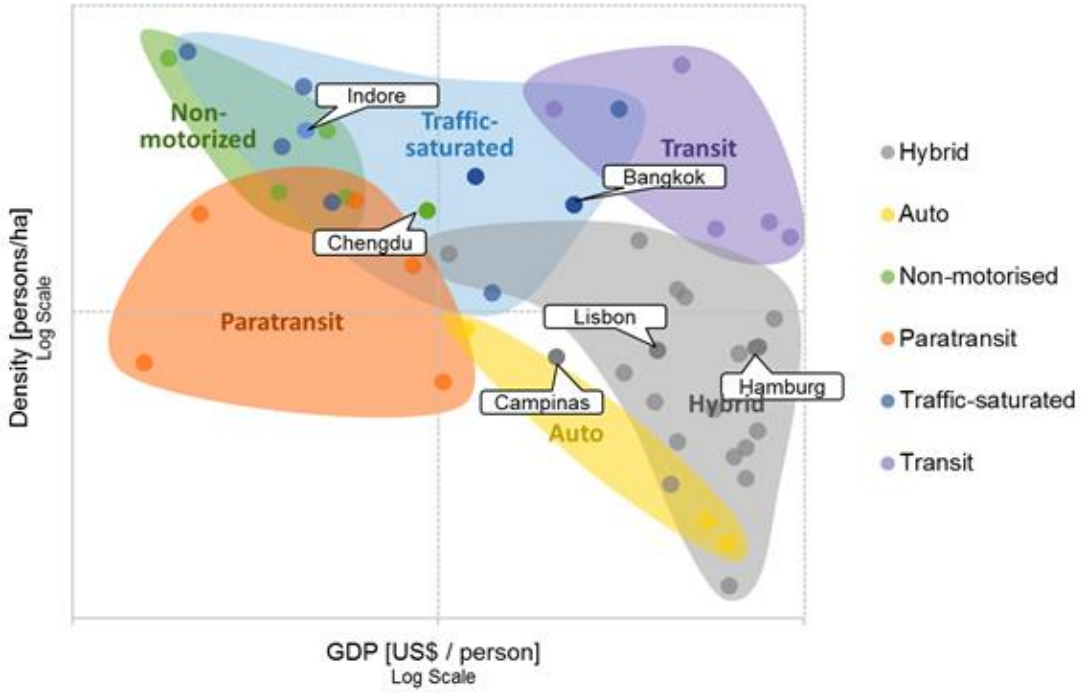
9.4 Cluster Analysis

City clusters and showcase cities plotted against GDP per capita and urban density

Six city clusters

SMP2.0 used a cluster analysis developed by Prof. Kenworthy[45] to characterize cities based on the performance of their mobility system, the ability to serve sustainable mobility, the challenges and opportunities.

The analysis uses 59 descriptors covering transport supply and impact, mobility and investment as well as general city descriptors. It plots cities according to their level of economic development and population density and identifies six clusters with common mobility features. In general, as cities develop they move along an arc beginning in the top left quadrant (Non-motorized) and widening as it curves to the right (Transit or Hybrid). The showcase cities are situated along this path, enabling the project to demonstrate that the SMP2.0 process is relevant to cities at many developmental stages



The cluster analysis demonstrates that some challenges and opportunities are common to different city clusters but there are also significant differences between them. It will help a city to understand its relative position, recognize relevant demand factors and the nature of the challenges.

The showcase cities are from along the mobility development arc. The cities range from Indore, which is Traffic-saturated but still displays some characteristics of Non-motorized and Para-transit, to Hamburg

[45] Mobility cultures in megacities, Technische Universität München on behalf of Institute for Mobility Research (IFMO), 2010

which is an advanced Hybrid city. Both Chengdu and Bangkok have a high density population, are developing quickly and are starting to move towards the Transit cluster. Campinas and Lisbon are both in the Hybrid cluster with a dense urban core with growing suburbs outside that core.

(For additional information regarding the cluster analysis and its use in SMP2.0, please visit www.wbcsd.org)

9.5 Indicator Analysis Explanation

9.5.1 Indicators from previous data

1. Traffic Safety

- **Definition:** Road and rail transport accidents in the city and damage caused
- **Parameter:** Fatalities per annum caused by urban transport per 100,000 inhabitants
- **Formula:**

$$FR = \frac{\sum_i K_i}{Cap} * 100.000$$

  - Ki = Number of fatalities in transport mode i
  - Cap = Number of inhabitants (capita)

- **Data Source:** Traffic Police Indore
- **Value & Scale:**

Values	Units	Min. Scale Score = 0	Max. scale Score = 10
16.42	*fatalities/cap*	35	0

- **Score: 5.3**
- **Comment:** Selected as one of the priority indicators.

2. Economic Opportunity

- **Definition:** Direct economic sector contribution to the welfare of the metropolitan area from city transport.
- **Parameter:** Share of GVA (Gross Value Added) by city transport sector and storage.
- **Formula:**

$$EO = \frac{100 * GVAT}{GDP}$$

  - GVAT = Contribution gross value added by transport and storage sectors (currency per year)
  - GDP = Total gross domestic product city (region) (currency per year)

- **Data Source:** ***Indore Department of Economics and Statistics***
- The proposed sources are the incomes according to the ISIC (international standard industry classification) (also used by the World Bank):
  - Section F: Construction; Division 42: Civil Engineering; 4210: Construction of roads and railways
  - Section G: Wholesale and retail trade; repair of motor vehicles and motorcycles
  - Division 46: Wholesale trade except of motor vehicles and motorcycles

- Section H: Transportation and storage
- Section N: Administrative and support service activities
- Division 77: Rental and leasing activities: 7710: Renting and leasing of motor vehicles

- **Scale:**

Values	Units	Min. Scale	Max. scale
11%	%	0%	18%

- **Issue:** It was not possible to have a further breakdown of the Construction Sector GDP into mobility versus other construction contributions. Therefore, this calculation includes an assumption that 25% of the total GDP for construction in the city is for mobility. With this assumption, Indore achieved a score of 6.3. If the assumption is for 75% mobility construction, the score would be 8.5 which would be a good score. In future, it is helpful to clarify the data for the construction sector.
- **Score:** 6.3
- **Comment:** Acceptable score

3. Intermodal Connectivity

- **Definition:** Intermodal connectivity of city transport offered by the physical presence of intermodal interchanges in the transport network.
- **Parameter:** Number of intermodal interchanges (i.e. number P&R interchanges between different Public Transport modes, PT stop or stations offering shared bikes availability) – relative to the surface of the city.
- **Formula:**

$$INF = \frac{(\sum_{i}(IC_i)}{Surf}$$

  - ICi = intermodal connection point I, is the sum of the connection at every node offering opportunity and facilities to switch mode (car, bike, tram, bus, train, car)
  - Surf = Surface of the city in square km
- **Data Source:** Intermodal connections were studied at 6 railway stations, 5 bus stands, and 3 major terminals.
- **Scale:**

Values	Units	Min. Scale	Max. scale
0.85	IC/km²	0	7

- **Score:** 1.2
- **Comment:** Poor score and selected as a priority Indicator. While buses and taxis are readily available in Indore, there is very little provision for car or bicycle parking, only one bike sharing station, and no metro and no trams making it very difficult for citizens to have convenient choice of transport mode.

4. Access to Mobility Services

- **Definition:** Share of population with appropriate access to mobility services
- **Parameter:** Percentage of population living within walking distance of public transport (stop or station) or shared mobility (car or bike) system. 800m for train, metro or car sharing station, 400 m for bus or tram stop or bike sharing station
- **Formula:**

$$AccI = \frac{\sum_i (PR_i)}{Cap}$$

  - PRi = Number of people living within acceptable radius of a station (or stop) of public or shared mode I (800m for train, metro or car sharing station, 400m for bus or tram stop or bike sharing station) (#)
  - Cap = Capita or number of inhabitants in the city (#)
- **Data Source:** Indore Ward & Map analysis
- **Value & Scale:**

Values	Units	Min. Scale	Max. scale
53%	%	0%	100%

- **Score:** 5.3
- **Issues:** Selected as a priority indicator; within many Wards there is no (13 of 85) or too few (32 of 85) bus stops.

5. Affordability of Public Transport for the poorest 25%

- **Definition:** Share of the public transport cost for fulfilling basic activities of the household budget for the poorest 25 percentile of the population.
- **Parameter:** Affordability index public transport for the poorest population quartile, based on the relation between the cost for 60 relevant public transport trips and the average monthly household income.
- **Formula:**

$$AI = \frac{\sum_i TPT_i * F10km_i}{Minc_{25\%}} * 60$$

  - TPTi = Monthly percentage of PT trips with PT mode I (%)
  - F10km = Fare 10 km PT trip with PT mode I (monetary unit)
  - Minc25% = Average monthly income of poorest population quartile (monetary unit)
  - 60 = sixty trips per month
- **Data Source:** AiCTSL

- **Value & Scale:**

Values	Units	Min. Scale	Max. scale
30%	%	35%	3.5%

- **Score:** 1.5
- **Issues:** Citizens can access functional needs by bicycle or walking; public transportation is fully occupied even at current pricing.

Comments: *Per Indicator calculating criteria, Rs. 10 per commute is unaffordable for 60 trips per month for the poorest quartile and 35% of survey respondents stated that public transport is too expensive. Public transport makes up only 27% of the transport mode for various reasons including affordability.*

6. Net Public Finance

- **Definition:** Net results of government and other public authorities' revenues and expenditures related to city transport. This indicator reflects the affordability for the government to sustain the expenditure in the transport system.
- **Parameter:** Net government and other public authorities revenues from transport related taxes and charges minus operational and other costs per GDP. Investments are excluded from the parameter calculation.
- **Formula:**

$$NPF_i = \frac{\sum_i C_i - \sum_j O_j}{GDP}$$

  - NPFi = Net Public Finance indicator of the city transport (%)
  - Ci = City government annual revenues from transport related chargers (all modes) (currency per year)
  - Oj = City government annual operational costs related to city transport (all modes) (currency per year)
  - GDP = Gross domestic product of the city (or the region considered) (currency per year)
- **Data Source:** AiCTSL
- **Value & Scale:**

Values	Units	Min. Scale	Max. scale
-0.24%	%	-2.50%	0.00%

- **Score:** 9.1
- **Comment:** Top score due to the net results of government revenues and expenditures related to public city transport. This indicator reflects the affordability for the government to *sustain* the expenditures in the transport system.

7. Greenhouse Gases

- **Definition**: Emissions of greenhouse gases (GHG) by all passenger and freight city transport modes considering well-to-wheels.
- **Parameter**: Tonne CO_2 eq. well-to-wheel by urban transport per annum per capita.
- **Formula**: $G = \frac{(\sum_{ij} A_{ij} * (\sum_k S_{ijk} * I_{jk} * (C_k * (1 + F_{ijk}) + W_k)))}{Cap}$

Where:

- G= Greenhouse gas emission [tons CO_2 (eq) /cap. per year]
- C_k = Tank to wheel CO_2 emission per energy type unit considered [kg/l or kg/kWh]
- W_k = Well to tank CO_2 equivalent emission per energy type unit considered [factor]
- A_{ij}= Activity volume (distance driven by transport mode I and vehicle type j) [million km per year]
- s_{ijk} = Share of fuel type k per vehicle type j [fraction]
- I_{jk} = Energy intensity per distance driven for vehicle type j and fuel type k [l/km or MJ/km or kWh/km]
- Cap = Capita or number of inhabitants in the city [#]
- F_{ijk} = Non-CO2 GHG correction (CO_2 equivalent) [factor]
- k = Energy type (petrol, diesel, bio-fuel, electricity, hydrogen…) [type]
- i = Transport mode (passenger car, tram, bus, train, motorcycle, inland vessel, freight train, truck...) [type]
- j = Vehicle type (if available specified by model (e.g. SUV,...) or brand [type]

- **Data source**: Using Comprehensive Mobility Plan for Indore Urban Area (CMP 2012) as the source for Activity Volume (A_{ij}). Using CO2 as provided by WBCSD SMP2.0 Indicator Analysis spreadsheet.
- **Value & Scale**:

Values	Units	Min. Scale	Max. scale
0.285	*GHG/cap*	2.75	0

- **Score**: 9
- **Comment**: Good score; the calculation considers number of vehicles relative to total Indore population. Due to the low number of vehicles and motorized transport per capita, this calculation gives a good score.

8. Vehicle Pollution

- **Definition:** Air polluting emissions of all passenger and freight city transport modes.
- **Parameter**: Total tailpipe emission harm equivalent per year per capita
- **Formula**:

$$EHI = \frac{\sum_s Eeq_s * (\sum_{ij} A_{ij} * (\sum_{ck} S_{ijk} * E_{ijkcs} * I_k))}{Cap}$$

  - EHI = Emission harm equivalent index [Kg Nox eq./cap per year]
  - Eeqs = Emission substance type equivalent health impact value[factor]
  - Eijkcs= emission of pollutant s per unit of energy consumed for fuel type k, emission class c of vehicle type j of transport mode i (g/l, g/kg)

- Aij= Activity volume (distance driven by transport mode I and vehicle type j) [million km per year]
- Sijk = Share of fuel type k per vehicle type j and per transport mode I [fraction]
- Ik = Energy intensity per distance driven per fuel type k [l/km or kWh/km or kg/km]
- Cap = Capita or number of inhabitants in the city [#]
- k = Energy type (petrol, diesel, bio-fuel, electricity, hydrogen…) [type]
- i = Vehicle type transport mode (passenger car, tram, bus, train, motorcycle, inland vessel, freight train, truck...) [type]
- j = Vehicle type(if available specified by model (e.g. SUV,...) or brand passenger car, tram, bus, train, motorcycle, inland vessel, freight train, truck...) [type]
- s= type of substance [type]
- c= emission class (euronorm) [type]

- **Data Source:** Using Comprehensive Mobility Plan for Indore Urban Area (CMP 2012) as the source for Activity Volume (A_{ij}). Using CO_2 as provided by WBCSD SMP2.0 Indicator Analysis spreadsheet.
- **Value & Scale:**

Values	Units	Min. Scale	Max. scale
15.23	$NO_{x\,eq}/cap$	75	0

- **Score:** 8
- **Comment:** Although this is a good score, Indore citizens are not satisfied with the level of air pollution in the city. The good score in this calculation is due primarily to the low number of vehicles and motor transport per capita. For example, in Indore passenger car annual vehicle km per capita is 173 whereas in Hamburg, annual vehicle km per capita is 5280.

9. Energy Efficiency

- **Definition:** Final energy consumed for city transport
- **Parameter**: Final energy use by urban transport per passenger km and tonne km (annual average over all modes)

$$E = \frac{(\sum_{ij} A_{ij}(\sum_{k} S_{jk} * I_{jk} * EC_k))}{TV_{pass} + \left(\frac{TV_{fre}}{8}\right)}$$

- **Formula**:
  - E = Energy consumption rate (MJ / km) [MJ/transport unit km]
  - TVpass = Transport volume passenger transport (passenger km) [million passenger km]
  - TVfre =Transport volume freight transport (ton km) [million ton km]
  - Sjk = Share of fuel type k per vehicle type j [fraction]
  - Ijk = Energy intensity per distance driven for veihcle type j and fuel type k [l/km or MJ/km or kWh/km]
  - Aij= Activity volume (distance driven by transport mode I and vehicle type j) [million km per year]
  - ECk = Fuel energy content for fuel k [l/km or MJ/km or kWh/km]

- k = Fuel type [type]
- i = Transport mode (passenger car, tram, bus, train, motorcycle, inland vessel, freight train, truck...) [type]
- j = Vehicle type(if available specified by model e.g. SUV,...) [type]

- **Data Source:** Using Comprehensive Mobility Plan for Indore Urban Area (CMP 2012) as the source for Activity Volume (A_{ij}). Using Energy Intensity as provided by WBCSD SMP2.0 Indicator Analysis spreadsheet.
- **Value & Scale:**

Values	Units	Min. Scale	Max. scale
1.20	*energy/km*	3.5	0.50

- **Score: 7.7**
- **Comment:** Acceptable score. Final energy consumed is low given the high annual passenger mileage; all modes of transportation are effectively (fully) utilized.

10. Functional Diversity

- **Definition:** Functional diversity refers to mix of spatial functions (e.g. shopping, lving, working, leisure) in an area, creating proximity of mutual interrelated activities.
- **Parameter:** Average presence (value 1) or not (value 0) of ten spatial functions related to daily activities except for work in grids of 1x1 km.
- **Predefined functions:**
  - Business (industry, offices, logistics)
  - Energy resources (e.g. petrol and gas stations)
  - Hospital and medical services
  - General services (post, administration)
  - Schools
  - Commercial (ships, supermarkets)
  - Sports and recreation
  - Residential (families)
  - Residence for elderly people
  - Park and Green

$$FDS = \sum_{ij} Pop_i(\forall Pres_{ij} > 0)$$

- **Formula:**
  - FDS= Functional diversity score [%]
  - Popi= Fraction of population of the city in zone ij [fraction]

- Presij= Presence of functions j in zone i (it is equal to 1 if there is presence it is equal to 0 if there is not presence) [binary]

- **Data Source:** Indore Census for 85 wards

- **Scale:**

Values	Units	Min. Scale	Max. scale
0.86	*score*	0%	100%

- **Score:** 8.6
- **Comment:** Good Score. Good coverage of commercial and civic functions within walking distance of the population, however, city needs more improvement on Sports & Recreation and Park & Green.

11. Opportunity for Active Mobility

- **Definition:** Options and infrastructure for active mobility which refers to the use of the modes walking and biking.
- **Parameter:** The length of roads and streets with sidewalks and biking lanes and 30 km/h (20 mph) zones and pedestrianized zones related to total length of city road network (excluding motorways).

$$R_{am} = 100 * \frac{(L_{sw} + L_{bl} + L_{z30} + L_{pz})}{L_{rn}}$$

- **Formula:**
  - Ram = Share of road length adapted for active mobility []
  - Lsw = Length of road network with sidewalks (if not included in other parameter) [km]
  - Lbl = Length of road network with bike lanes (if not included in other parameter) [km]
  - Lz30 = Length of road network in zone 30 km/h (if not included in other parameter) [km]
  - Lpz = Length pedestrian zone (if not included in other parameter) [km]
  - Lrn = Total length of city road network (excluding motorways) [km]

- **Data Source:** IMC 2012, City Development Plan 2006

- **Scale:**

Values	Units	Min. Scale	Max. scale
11%	%	0%	100%

- **Score: 1.1**
- **Issues:** Low score due to poor infrastructure for active mobility. Addition of sufficient dedicated bicycle lanes and pedestrian lanes (sidewalks) could improve the score. Additionally, resolution of entrepreneur encroachment onto existing pedestrian lanes could improve available active mobility space.

12. Congestion and Delay

- **Definition:** Congestion in road traffic and delays in public transport deviation (extra time needed to drive or travel) from free-flowing for all transport modes during peak hours.
- **Parameter:** Weighted average per trip of the ratio of peak period travel times to free-flowing travel times in road traffic and travel time adherence of public transport during peak hours on up to ten major corridors of both transport modes.
- **Formula:**

$$CDi = MS_{road} * \frac{\left(\sum_{i=1}^{10}\left(\frac{CTi * PHTi}{FFTi}\right)\right)}{\sum_{i=1}^{10} CTi} + MS_{pt} * \frac{\left(\sum_{j=1}^{10}(PTj * RTIj)\right)}{\sum_{j=1}^{10} PTj}$$

  - CDi = Congestion and delay index (percentage delay during peak hours) [% of delay]
  - CTi = Number of car trips for commuting during peak hours on main road corridor I [#]
  - PHTi = Travel time during peak hours on main road corridor I [minutes:seconds]
  - FFTi = Free flow travel time on main road corridor I [minutes:seconds]
  - PTj = Number of public transport trips for commuting during peak hours on transit corridor j [#]
  - RTIj = Running time adherence index giving real travel time during peak hours related to time indicated in time table on transit corridor j [index]
  - MSroad = Modal share road [%]
  - MSpt= Modal share public transport[%]

A different formula was used for Indore based on the availability of data from an earlier Congestion study. iRites determined a degree of congestion across 106 major links in the Indore roadway.

$$Dc = ((Sp-So) \times 100) / Sp$$

And therefore, CDi = avg(Peak Deg of Congestion)/(off Peak Deg of Congestion) for i = 1 through 106

Where: Dc = Degree of Congestion; Sp = Maxiumum posted speed; So = Maximum observed speed

- **Data Source:** iRites traffic survey, Indore Interim Report
- **Scale:**

Values	Units	Min. Scale	Max. scale
1.15	*index*	1.35	1

- **Score:** 5.8
- **Comments:** Selected as a priority Indicator. Note that public transport was not treated separately in this analysis. BRT having dedicated lanes would have a good score for congestion which is not included in this total. Other city buses sharing the same links as the rest of the traffic are included in the comprehensive "degree of congestion" analysis performed by iRites. While 5.8 is an acceptable score, the primary concern for Indore is the significant population growth it has experienced recently and which will continue. Increased population in the city will result in more demand for

mobility and significant increase in congestion. Solutions are required now in order to prevent the score from dropping substantially in the very near term.

13. Mobility Space Usage

- **Definition:** Proportion of land use, taken by all city transport modes, including direct and indirect uses.
- **Parameter:** Square meter of direct and indirect mobility space usage per capita.
- **Formula:**

$$LUM = \frac{\sum_i (LD_i + LI_i)}{Cap}$$

  - LUM = Land use for mobility applications [m²]
  - LDi = Direct Land use for mobility mode i [m²]
  - LIi = Indirect Land use for mobility mode i [m²]
  - i = Mobility mode [#]
  - Cap = Capita or number of inhabitants in the city [#]

- **Data Source:** various sources including iRites study
- **Scale**

Values	Units	Min. Scale	Max. scale
8.13	*m²/cap*	125	25

- **Score:** 10
- **Comments:** Although the calculation shows good score, Indore would benefit from more balanced planning on efficient land use. There are very few parking places assigned with respect to city area. There is no separate facility for pedestrian/cycle and other vehicles.

14. Occupancy Rate

- **Definition:** Average load factor of vehicles of all modes of city transport
- **Parameter:** Weighted sum of average load factors per transport mode per vehicle distance on an average working day.
- **Formula:**
  - LFav = Average load factor of city transport [#]
  - LFi = Average load factor freight for freight mode i (as percentage of total moved capacity) [fraction]
  - DFi = Total distance driven by freight mode i [million vehicle km per year]
  - LPj = Average load factor (occupancy rate) of public transport mode j (as percentage of total moved capacity) [fraction]

- DPj = Total distance driven by public transport mode j [million vehicle km per year]
- LC = Average load factor (occupancy rate) of transport by car (as percentage of total moved capacity) [%]
- DC = Total distance driven by cars [million vehicle km]
- MC = Average load factor (occupancy rate) of transport by motor cycle [%]
- DM = Total distance driven by motor cycle [million vehicle km year]
- Dtot = Total Distance driven by the considered transport modes [million vehicle km per year]
- i = Freight mode number [type]
- j = Public transport mode number [type]

- **Data Source:** Indore Municipal Corporation, Comprehensive Mobility Plan for Indore Urban Area, 2012, iRites
- **Value and Scale:**

Values	Units	Min. Scale	Max. scale
103%	%	10%	65%

- **Score:** 10
- **Comments:** Good score for use of transport modes since occupancy rate is very high for Indore across all mobility modes.

9.5.2 Indicators from Survey

15. Comfort and Pleasure

- **Definition:** The physical and mental comfort of urban transport and services for all people.
- **Parameter:** Average reported satisfaction about comfort of city transport and of pleasure of moving in the city area.
- **Data Source:** Online survey at citybusindore.com; and personal interview and paper survey via agency ISSW.
- **Formula:** Average value of all responses with a weighting of 10, 7.5, 5, 2.5, and 0 for the most satisfied to least satisfied responses.
- **Scale:** 10, Completely satisfied. 0, very dissatisfied.
- **Score:** 3.8
- **Comments:**
  - Respondents are primarily dissatisfied with public transport in general due to cleanliness, availability of seats and comfort (seats, temperature). On an average more than 75% population is satisfied with the BRTS except in case of availability of seats and buggy space.
  - Quantity and location of parking spaces is the primary contributor to respondents' dissatisfaction with driving in the city.

- When considering cycling in the city, respondents are dissatisfied with many aspects of cycling in the city, among these aspects they are significantly dissatisfied with availability and width of dedicated cycling lanes.
- When considering walking in the city, respondents are dissatisfied with availability and quality of sidewalks and car free streets in the city.

16. Quality of Public Area

- **Definition:** Presence in the city of streets and squares that offer sociability and good image.
- **Parameter:** Reported social usage of streets and squares and subjective appreciation of the public area quality.
- **Formula:** Average value of all responses with a weighting of 10, 7.5, 5, 2.5, and 0 for the most satisfied to least satisfied responses.
- **Data Source:** Survey
- **Scale:** 10, Completely satisfied. 0, very dissatisfied.
- **Score:** 2.5
- **Comments:** Most respondents (75%) are unsatisfied with availability of public spaces for walking, socializing, and recreation. And within the public spaces respondents are mostly (80%) unsatisfied with crowding.

17. Intermodal Integration

- **Definition:** Quality of the interchange facilities between different transport modes.
- **Parameter:** Reported quality of interchange facilities between different transport modes referring to integration of organization of the subsystems and the physical quality of the interchange facilities.
- **Formula:** Average value of all responses with a weighting of 10, 7.5, 5, 2.5, and 0 for the most satisfied to least satisfied responses.
- **Data Source:** Survey
- **Scale:** 10, Completely satisfied. 0, very dissatisfied.
- **Score:** 2.7
- **Comments:** Most respondents (72%) are unsatisfied with the availability of connection points for intermodal travel and the walking distance between modes. At least 65% of respondents are unsatisfied with the frequency of connecting public transport, the integration of ticketing and schedules, and quality of trip information.

18. Security

- **Definition:** Risk for crime in urban transport.

- **Parameter:** Reported perception about crime-related securing in the city transport system (including freight and public transport, public domain, bike lanes, and roads for car traffic and other facilities such as car or bike parking).
- **Formula:** Average value of all responses with a weighting of 10, 7.5, 5, 2.5, and 0 for the most satisfied to least satisfied responses.
- **Data Source:** Survey
- **Scale:** 10, not at all unsafe. 0, very unsafe.
- **Score:** 4.0
- **Comments:** Respondents feel significantly less safe at night through all modes of mobility than during the daytime. When asked about their feelings about security in public spaces at night, 79% of respondents felt at least rather *UNSAFE* at night compared with 58% feeling at least rather *UNSAFE* during the daytime.

  86% of respondents felt at least rather unsafe at night while cycling and 79% of respondents felt at least rather unsafe at night while walking. Respondents also expressed concern for security during the daytime with 69% felt rather unsafe while cycling during daytime and 62% felt rather unsafe while walking during daytime.

19. Inclusive Access

- **Definition:** The accessibility for deficiency groups to transport and transport services.
- **Parameter:** Average reported convenience of city transport for target groups.
- **Formula:** Average value of all responses with a weighting of 10, 7.5, 5, 2.5, and 0 for the most satisfied to least satisfied responses.
- **Data Source:** Survey
- **Scale:** 10, completely satisfied. 0, dissatisfied.
- **Score:** 3.3
- **Comments:**
  - Among pregnant respondents, more than 80% are dissatisfied with availability of parking spaces for expectant mothers and the availability of benches around the city.
  - Among older persons, 62% are unsatisfied with the availability and location of parking spaces.
  - Among physically impaired, 73% are unsatisfied with the availability and location of parking spaces.
  - Among visually impaired, 58% were unsatisfied with the access of public transport vehicles at stations or stops.

20. Travel Time

- **Definition:** Duration to commute (travel to work or to an educational establishment).

- **Parameter:** Average time to commute (travel to work or to an educational establishment and back home) in the city expressed in minutes per person per day.
- **Data Source:** Survey
- **Scale:** 10, 10 minutes two way commute. 0, 90 minutes two way commute.
- **Score:** 4.1
- **Comments:** The average commuting time is 58 minutes; average reported commuting travel distance of 18 km.

Data Input References:

- ISSW Survey & Qualtrics Final Report Summary, June 2015
- Indore Municipal Corporation, Comprehensive Mobility Plan for Indore Urban Area, 2012, iRites
- Global Mobility Monitor Network (GMMN), India Mobility Final Report, September 2013
- Asian Cities Climate Change Resilience Network (ACCCRN), 2010

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Updates:

13 January 2016 updates were made to change indicator names to titles which are more descriptive for the local Indore context. Also, Vehicle Pollution calculation was modified to reflect a weighting factor due to age of Indore vehicles. Air Pollution changed to Vehicle Pollution. Access for Mobility Impaired changed to Inclusive Access.

9.6 Details of Citizen Survey

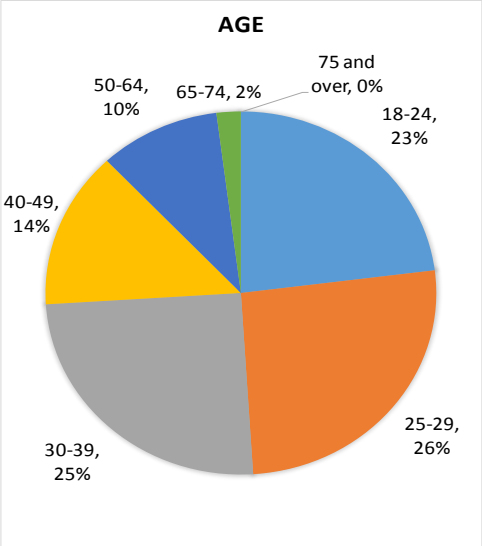
9.6.1 Demographics and details of survey respondents

The survey was conducted from 20 April through 7 May. While the survey was available on-line, the majority of respondents were personally interviewed by agency ISSW. There was a total of 798 respondents out of which 88% of respondents live in the city of Indore.

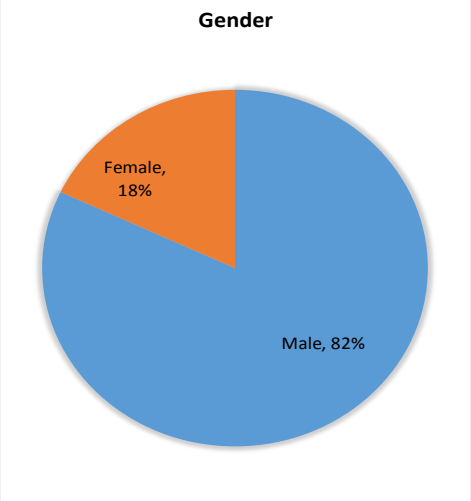
Description

- 23% in 18 – 24 years
- 26% in 25 – 29 years
- 25% in 30 – 39 years
- 26% in 40 and older

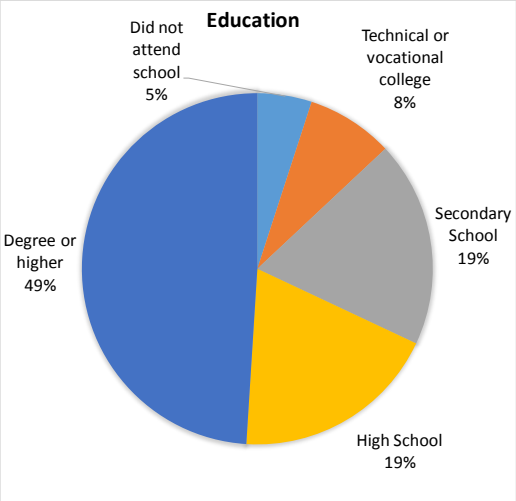
Profile of respondents of citizen survey conducted



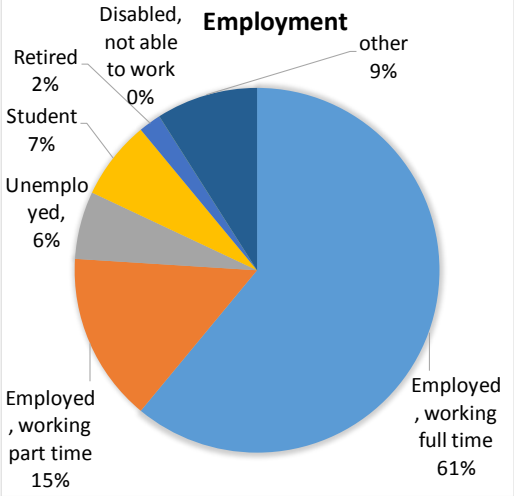
Respondents were - 82% Male, 18% Female



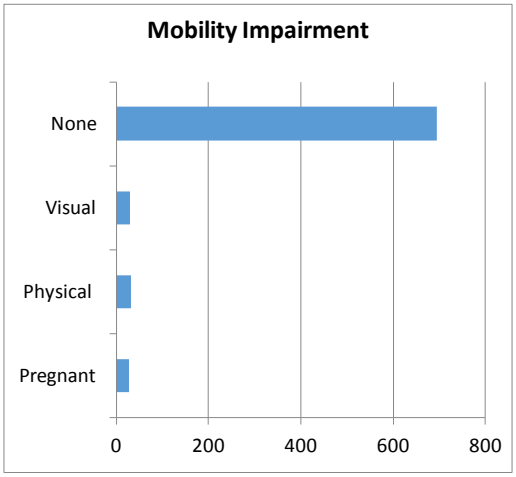
- 49% have a degree or higher.



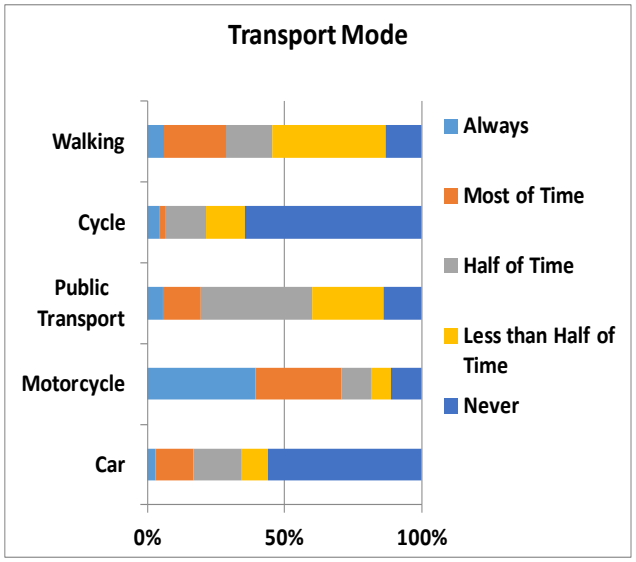
- 61% are employed full time.
- 15% are employed part time



- 28 respondents were pregnant.
- 31 respondents suffer from physical mobility impairment.
- 29 respondents suffer from moderate to severe visual impairment.



While roughly 50% have no car or bicycle, 90% have at least one motorcycle. Only 20% use public transportation as their predominant commuting mode.



9.6.2 Key questions asked in the survey

How many times did you travel last week to the following -

#	Question	5 or more	4	3	2	1	0	Total Responses	Mean
1	your place of work or study	615	53	25	39	27	18	777	1.54
2	for leisure or other reasons	143	61	137	201	205	48	795	3.51

Statistic	your place of work or study	for leisure or other reasons
Min Value	1	1
Max Value	6	6
Mean	1.54	3.51
Variance	1.50	2.36
Standard Deviation	1.22	1.54
Total Responses	777	795

What was your principle mode of transport for your commute?

#	Question	Always	most of the time	about half of the time	less than half of the time	never	Total Responses	Mean
1	Car	24	107	140	74	438	783	4.02
2	Motorcycle	308	247	84	57	86	782	2.19
4	Public transport	45	108	317	205	108	783	3.28
5	Cycle	32	102	104	100	445	783	4.05
6	Walking	48	176	132	326	101	783	3.33
7	Other	33	56	54	164	476	783	4.27
8	Combination of modes	6	34	31	31	681	783	4.72

Statistic	Car	Motorcycle	Public transport	Cycle	Walking	Other	Combination of modes
Min Value	1	1	1	1	1	1	1
Max Value	5	5	5	5	5	5	5
Mean	4.02	2.19	3.28	4.05	3.33	4.27	4.72
Variance	1.56	1.75	1.10	1.59	1.30	1.27	0.63
Standard Deviation	1.25	1.32	1.05	1.26	1.14	1.13	0.80
Total Responses	783	782	783	783	783	783	783

Could you give us some details about your commute please -

What was the average travel distance (one way) in km:	What was the average travel time to work in minutes	What was the average travel time to return home in minutes	If you have to be certain of being at work/home for an important appointment how much extra time do you allow for the journey
30	15	20	10
10	45	45	20
6	13-19	20	10 min
4 km	15 min	15 min	5 min
15	30	30	30
20	30-40	30-35	25-30
10	180 Minute	60 Minute	30 Minute
15	25	25	20
5	1 hour	1 hour	15
20	50	50	20
15 kms	35 minutes	30 minutes	5 minutes
10	10	5	5
7	30	30	40
7 km	45 minutes	1 hour	1/2 hour
15	30	45	15
5	35	50	30
5	20	24	15
15	20	20	20
10	20	20	5
8	60	90	30
344	76	886	997
12	10	10	10
5	60	120	15
22	30	35	20 min
20	30	30	10
5	10	10	30
60	120	120	1HR
15	30	40	10
16	30	45	30 mins
30	45	45	
8	30	30	15
6	12	12	10
5	30	25	15
40	45	45	15
10	30	30	20
8	30	30	15
8	40	35	45
8	15	15	15
7	20	20	30
7	20	20	30
30	40	64	64

5	30	45	45
6	60	60	15
3	30	30	5
4	30	30	15
10	20	25	5
10	35	35	10
4	20	20	10
4	30	30	10
5	30	35	40
7	40	40	50
10	40	35	50
4	20	20	30
9	30	35	40
10	20	20	15
10	20	25	60
8	30	30	40
8	40	45	40
4	14	14	12
10	25	35	15
15	20	30	60
10	20	20	10
20	25	30	60
20	30	40	60
2	30	30	10
20	30	40	60
20	20	20	10
10	30	30	60
20	25	30	60
9	20	20	20
25	30	50	60
20	30	40	30
20	30	40	30
6	17	20	60
20	25	30	60
15	20	25	60
20	35	40	60
14	20	20	10
6	15	15	10
20	35	40	60
4	30	30	30
1	15	15	5
15	30	30	60
15	25	25	10
15	25	25	10
20	30	20	10
15	20	25	60
30	30	30	60
9	25	25	20
15	25	25	10
6	15	15	10

10	60	30	30
5	25	25	20
12	25	25	30
3	15	20	25
2	10	10	15
3	15	15	10
3	15	20	15
15	60	45	30
2	10	10	15
10			15

Statistic	Value
Total Responses	779

At what time of the morning does your daily commute typically start?

#	Answer		Response	%
1	Before 06:00		10	1%
2	06:00-07:00		21	3%
3	07:00-08:00		122	16%
4	08:00-09:00		232	31%
5	After 09:00		368	49%
	Total		753	100%

Statistic	Value
Min Value	1
Max Value	5
Mean	4.23
Variance	0.83
Standard Deviation	0.91
Total Responses	753

As an older traveler how satisfied are you with the following?

#	Question	completely satisfied	very satisfied	satisfied	less satisfied	dissatisfied	Total Responses	Mean
1	Quantity and location of parking spaces?	5	3	29	31	29	97	3.04
2	Accessibility of the parking places on foot?	3	12	27	35	20	97	3.53
3	Accessibility of the public transport stops?	6	9	30	36	16	97	3.79
4	Access of the public transport vehicles at the stops or stations	2	7	32	36	20	97	3.32
5	Quantity of seating places in the public transport?	4	9	29	27	28	97	3.30
8	Quality of the sidewalks?	1	9	30	25	32	97	2.99

Statistic	Quantity and location of parking spaces?	Accessibility of the parking places on foot?	Accessibility of the public transport stops?	Access of the public transport vehicles at the stops or stations	Quantity of seating places in the public transport?	Quality of the sidewalks?
Min Value	0	0	0	0	0	0
Max Value	10	10	10	10	10	10
Mean	3.04	3.53	3.79	3.32	3.30	2.99
Variance	7.19	6.87	7.18	5.69	7.75	6.72
Standard Deviation	2.68	2.62	2.68	2.39	2.78	2.59
Total Responses	97	97	97	97	97	97

What are the main reasons for you to not use public transport regularly?

#	Question	Yes	No	Total Responses	Mean
6	It is too expensive	265	489	754	1.65
7	It's too dirty	490	286	776	1.37
8	I don't think it is comfortable (seats, noise, temperature)	510	266	776	1.34
9	Public transport vehicles aren't safe	491	285	776	1.37
10	I feel threatened using public transport	400	376	776	1.48
11	I don't feel informed about routes and timetables	452	324	776	1.42
12	Public transport is often not reliable	497	278	775	1.36
13	Public transport schedules do not fit my needs (e. g. not frequent or flexible enough)	558	218	776	1.28
14	None of these	152	624	776	1.80

Statistic	It is too expensive	It's too dirty	I don't think it is comfortable (seats, noise, temperature)	Public transport vehicles aren't safe	I feel threatened using public transport	I don't feel informed about routes and timetables	Public transport is often not reliable	Public transport schedules do not fit my needs (e. g. not frequent or flexible enough)	None of these
Min Value	1	1	1	1	1	1	1	1	1
Max Value	2	2	2	2	2	2	2	2	2
Mean	1.65	1.37	1.34	1.37	1.48	1.42	1.36	1.28	1.80
Variance	0.23	0.23	0.23	0.23	0.25	0.24	0.23	0.20	0.16
Standard Deviation	0.48	0.48	0.47	0.48	0.50	0.49	0.48	0.45	0.40
Total Responses	754	776	776	776	776	776	775	776	776

How often do you use the following types of public transport?

#	Question	(Almost) never	A few times a year	A few times a month	A few times a week	Daily	Total Responses	Mean
4	Buses	159	283	224	92	30	788	2.43
5	BRT	356	119	137	139	37	788	2.22
6	Magic Vans	236	248	180	92	32	788	2.28

Statistic	Buses	BRT	Magic Vans
Min Value	1	1	1
Max Value	5	5	5
Mean	2.43	2.22	2.28
Variance	1.11	1.71	1.28
Standard Deviation	1.05	1.31	1.13
Total Responses	788	788	788

How often do you drive a car?

#	Answer		Response	%
1	(Almost) never		429	55%
2	A few times a year		41	5%
3	A few times a month		119	15%
4	A few times a week		114	15%
5	Daily		71	9%
	Total		774	100%

Statistic	Value
Min Value	1
Max Value	5
Mean	2.17
Variance	2.10
Standard Deviation	1.45
Total Responses	774

When on public transport how much do you.....

#	Question	very much	rather much	rather	rather not	not at all	Total Responses	Mean
5	enjoy riding the bus	19	241	233	120	103	716	4.84
6	enjoy riding the BRT	32	92	125	130	333	712	2.75
7	enjoy riding the magic van	136	198	165	74	122	695	5.55

Statistic	enjoy riding the bus	enjoy riding the BRT	enjoy riding the magic van
Min Value	0	0	0
Max Value	10	10	10
Mean	4.84	2.75	5.55
Variance	7.39	9.73	11.44
Standard Deviation	2.72	3.12	3.38
Total Responses	716	712	695

Do you feel unsafe because of potential physical attacks in the following situations?

#	Question	Very unsafe	Rather much unsafe	rather unsafe	quiet safe	very safe	Total Responses	Mean
4	Waiting for public transport at the stop or at the station during daytime	66	124	267	232	32	721	5.14
5	Waiting for public transport at the stop or at the station during nighttime	252	213	121	119	16	721	3.04
6	Being on board public transport during daytime	77	128	220	244	52	721	5.23
7	Being on board public transport during nighttime	295	161	147	109	9	721	2.84

Statistic	Waiting for public transport at the stop or at the station during daytime	Waiting for public transport at the stop or at the station during nighttime	Being on board public transport during daytime	Being on board public transport during nighttime
Min Value	0	0	0	0
Max Value	10	10	10	10
Mean	5.14	3.04	5.23	2.84
Variance	6.47	8.33	7.66	8.21
Standard Deviation	2.54	2.89	2.77	2.87
Total Responses	721	721	721	721

I don't make inter-modal trips more often because.....

#	Question	Yes	No	Total Responses	Mean
10	I do not have the information about the other modes to be able to effectively make connections	401	366	767	1.48
11	It is difficult to physically make the connections because of distance or steps	436	332	768	1.43
12	The waiting time between the two modes is too long	495	273	768	1.36
13	It is difficult to find the stops for the other modes	385	383	768	1.50
14	My ticket is only valid on one mode of transport	489	279	768	1.36
15	None of these	206	564	770	1.73

Statistic	I do not have the information about the other modes to be able to effectively make connections	It is difficult to physically make the connections because of distance or steps	The waiting time between the two modes is too long	It is difficult to find the stops for the other modes	My ticket is only valid on one mode of transport	None of these
Min Value	1	1	1	1	1	1
Max Value	2	2	2	2	2	2
Mean	1.48	1.43	1.36	1.50	1.36	1.73
Variance	0.25	0.25	0.23	0.25	0.23	0.20
Standard Deviation	0.50	0.50	0.48	0.50	0.48	0.44
Total Responses	767	768	768	768	768	770

What are the main reasons for you not ride a cycle in the city regularly?

#	Question	Yes	No	Total Responses	Mean
4	There are too few dedicated lanes for cycling	392	331	723	1.46
5	The cycle lanes are of poor quality	369	399	768	1.52
6	The way other road users treat cyclists	321	447	768	1.58
7	The roads are of poor quality for cycling	358	410	768	1.53
8	The cycle parking facilities in the city are too few and too unsafe	378	390	768	1.51
9	I don’t feel safe from physical attacks	359	409	768	1.53
10	The risk to be involved in an accident	363	405	768	1.53
11	None of these	369	398	767	1.52

Statistic	There are too few dedicated lanes for cycling	The cycle lanes are of poor quality	The way other road users treat cyclists	The roads are of poor quality for cycling	The cycle parking facilities in the city are too few and too unsafe	I don't feel safe from physical attacks	The risk to be involved in an accident	None of these
Min Value	1	1	1	1	1	1	1	1
Max Value	2	2	2	2	2	2	2	2
Mean	1.46	1.52	1.58	1.53	1.51	1.53	1.53	1.52
Variance	0.25	0.25	0.24	0.25	0.25	0.25	0.25	0.25
Standard Deviation	0.50	0.50	0.49	0.50	0.50	0.50	0.50	0.50
Total Responses	723	768	768	768	768	768	768	767

What are the main reasons for you not to walk regularly?

#	Question	Yes	No	Total Responses	Mean
4	There are too few sidewalks	611	154	765	1.20
5	The sidewalks are of poor quality	600	165	765	1.22
6	There are too few car free areas	548	217	765	1.28
7	The signposting of directions and destinations for walking aren't good enough	514	251	765	1.33
8	The sidewalks are poorly lit	653	112	765	1.15
9	I fear personal attacks	479	286	765	1.37
10	None of these	116	650	766	1.85

Statistic	There are too few sidewalks	The sidewalks are of poor quality	There are too few car free areas	The signposting of directions and destinations for walking aren't good enough	The sidewalks are poorly lit	I fear persona l attacks	None of these
Min Value	1	1	1	1	1	1	1
Max Value	2	2	2	2	2	2	2
Mean	1.20	1.22	1.28	1.33	1.15	1.37	1.85
Variance	0.16	0.17	0.20	0.22	0.13	0.23	0.13
Standard Deviation	0.40	0.41	0.45	0.47	0.35	0.48	0.36
Total Responses	765	765	765	765	765	765	766

What was your principle mode of transport for your commute ?

#	Question	Always	most of the time	about half of the time	less than half of the time	never	Total Responses	Mean
1	Car	24	107	140	74	438	783	4.02
2	Motorcycle	308	247	84	57	86	782	2.19
4	Public transport	45	108	317	205	108	783	3.28
5	Cycle	32	102	104	100	445	783	4.05
6	Walking	48	176	132	326	101	783	3.33
7	Other	33	56	54	164	476	783	4.27
8	Combination of modes	6	34	31	31	681	783	4.72

Statistic	Car	Motorcycle	Public transport	Cycle	Walking	Other	Combination of modes
Min Value	1	1	1	1	1	1	1
Max Value	5	5	5	5	5	5	5
Mean	4.02	2.19	3.28	4.05	3.33	4.27	4.72
Variance	1.56	1.75	1.10	1.59	1.30	1.27	0.63
Standard Deviation	1.25	1.32	1.05	1.26	1.14	1.13	0.80
Total Responses	783	782	783	783	783	783	783

Please provide some more details on the provision of services that take into account your pregnancy

#	Question	very satisfied	mostly satisfied	satisfied	mostly dissatisfied	very dissatisfied	Total Responses	Mean
1	Are you satisfied with the availability of parking spaces for expectant mothers?	3	1	1	15	8	28	2.86
2	Are you satisfied with the access to the parking places on foot?	0	4	7	11	6	28	3.30
3	Are you satisfied with the access to the bus and BRT stops on foot?	1	2	7	8	10	28	2.86
4	Are you satisfied with the the benches and chairs in stations and at stops?	0	1	9	13	5	28	3.04
5	Are there enough seating places in buses / BRT?	0	5	5	10	8	28	3.13
7	Are you satisfied with the availability of benches and chairs around the city?	3	1	1	10	13	28	2.41

Statistic	Are you satisfied with the availability of parking spaces for expectant mothers?	Are you satisfied with the access to the parking places on foot?	Are you satisfied with the access to the bus and BRT stops on foot?	Are you satisfied with the the benches and chairs in stations and at stops?	Are there enough seating places in buses / BRT?	Are you satisfied with the availability of benches and chairs around the city?
Min Value	0	0	0	0	0	0
Max Value	10	8	10	8	8	10
Mean	2.86	3.30	2.86	3.04	3.13	2.41
Variance	9.13	6.04	7.74	3.87	7.23	10.41
Standard Deviation	3.02	2.46	2.78	1.97	2.69	3.23
Total Responses	28	28	28	28	28	28

As someone with physical mobility issues how satisfied are you with the following?

#	Question	completely satisfied	very satisfied	satisfied	less satisfied	dissatisfied	Total Responses	Mean
1	Quantity and location of disabled parking spaces?	4	3	1	11	12	31	3.06
2	Accessibility of the disabled parking places on foot?	2	2	5	7	15	31	2.50
3	Accessibility of the public transport stops?	5	1	6	9	10	31	3.55
4	Access of the public transport vehicles at the stops or stations	5	3	8	5	10	31	4.03
8	Quality of the sidewalks?	3	3	6	4	15	31	2.98
9	Provision of space for your wheelchair on public transport?	3	1	10	4	13	31	3.15

Statistic	Quantity and location of disabled parking spaces?	Accessibility of the disabled parking places on foot?	Accessibility of the public transport stops?	Access of the public transport vehicles at the stops or stations	Quality of the sidewalks?	Provision of space for your wheelchair on public transport ?
Min Value	0	0	0	0	0	0
Max Value	10	10	10	10	10	10
Mean	3.06	2.50	3.55	4.03	2.98	3.15
Variance	12.38	9.58	12.41	13.20	12.26	10.82
Standard Deviation	3.52	3.10	3.52	3.63	3.50	3.29
Total Responses	31	31	31	31	31	31

How satisfied are you with the following, given your visual impairment

#	Question	completely satisfied	very satisfied	satisfied	less satisfied	dissatisfied	Total Responses	Mean
3	Accessibility of the public transport stops?	6	2	6	3	12	29	3.88
4	Access of the public transport vehicles at the stops or stations	2	3	7	8	9	29	3.36
8	Quality of the sidewalks?	2	5	7	3	12	29	3.45
9	Are you satisfied with guidance and warning systems for visual disabled people along sidewalks?	2	5	9	6	7	29	4.05

Statistic	Accessibility of the public transport stops?	Access of the public transport vehicles at the stops or stations	Quality of the sidewalks?	Are you satisfied with guidance and warning systems for visual disabled people along sidewalks?
Min Value	0	0	0	0
Max Value	10	10	10	10
Mean	3.88	3.36	3.45	4.05
Variance	15.89	9.50	11.79	9.56
Standard Deviation	3.99	3.08	3.43	3.09
Total Responses	29	29	29	29

How do you feel about driving in the city? How satisfied are you with the following items?

#	Question	dissatisfied	less satisfied	satisfied	very satisfied	completely satisfied	Total Responses	Mean
6	traffic circulation	120	346	257	3	2	728	3.01
7	real time traffic information	130	344	205	19	29	727	3.19
8	signposting of directions and destinations for road users	139	271	300	16	2	728	3.18
9	the lighting of urban streets for driving at night	200	265	241	22	0	728	2.79
10	quantity and location of parking spaces	247	330	137	11	3	728	2.23
11	accessibility of parking spaces by foot (e.g. no barriers like high pavements)	226	289	187	22	3	727	2.55
12	parking tariffs	224	260	215	27	2	728	2.68
13	quality of road infrastructure	241	251	223	11	2	728	2.53
14	traffic safety	237	279	192	18	2	728	2.49
15	feeling of personal security	205	278	212	27	6	728	2.77

Statistic	traffic circulation	real time traffic information	signposting of directions and destinations for road users	the lighting of urban streets for driving at night	quantity and location of parking spaces	accessibility of parking spaces by foot (e.g. no barriers like high pavements)	parking tariffs	quality of road infrastructure	traffic safety	feeling of personal security
Min Value	0	0	0	0	0	0	0	0	0	0
Max Value	10	10	10	8	10	10	10	10	10	10
Mean	3.01	3.19	3.18	2.79	2.23	2.55	2.68	2.53	2.49	2.77
Variance	3.24	5.31	4.01	4.46	3.84	4.54	4.83	4.52	4.46	4.90
Standard Deviation	1.80	2.30	2.00	2.11	1.96	2.13	2.20	2.13	2.11	2.21
Total Responses	728	727	728	728	728	727	728	728	728	728

What are the main reasons for you not ride a cycle in the city regularly?

#	Question	Yes	No	Total Responses	Mean
4	There are too few dedicated lanes for cycling	392	331	723	1.46
5	The cycle lanes are of poor quality	369	399	768	1.52
6	The way other road users treat cyclists	321	447	768	1.58
7	The roads are of poor quality for cycling	358	410	768	1.53
8	The cycle parking facilities in the city are too few and too unsafe	378	390	768	1.51
9	I don’t feel safe from physical attacks	359	409	768	1.53
10	The risk to be involved in an accident	363	405	768	1.53
11	None of these	369	398	767	1.52

Statistic	There are too few dedicated lanes for cycling	The cycle lanes are of poor quality	The way other road users treat cyclists	The roads are of poor quality for cycling	The cycle parking facilities in the city are too few and too unsafe	I don't feel safe from physical attacks	The risk to be involved in an accident	None of these
Min Value	1	1	1	1	1	1	1	1
Max Value	2	2	2	2	2	2	2	2
Mean	1.46	1.52	1.58	1.53	1.51	1.53	1.53	1.52
Variance	0.25	0.25	0.24	0.25	0.25	0.25	0.25	0.25
Standard Deviation	0.50	0.50	0.49	0.50	0.50	0.50	0.50	0.50
Total Responses	723	768	768	768	768	768	768	767

Please rank the following aspects of cycling in the city starting with the item which is most important to you. *(1 being the most important)*

#	Answer											Total Responses
1	availability of dedicated lanes for cycling	302	118	34	24	17	18	21	49	72	113	768
2	width of cycle lanes	139	304	41	24	13	21	19	49	99	59	768
3	quality of road surface of the cycle lanes	29	71	231	67	102	65	49	41	43	70	768
4	the way other road users treat cyclists when on mixed use roads	20	34	58	227	82	59	78	73	91	46	768
5	signposting of directions and destinations for cycling	26	43	108	76	186	99	60	69	46	55	768
6	lighting of cycling facilities and urban streets at night	42	40	53	92	91	220	74	62	52	42	768
7	number and the location of cycle parking facilities in the city	29	35	52	77	86	72	231	99	39	48	768
8	security of the cycle parking facilities	78	25	55	66	70	94	98	195	51	36	768
9	feeling of personal security	54	43	65	69	70	50	82	63	184	88	768
10	traffic safety	82	55	70	44	55	61	50	64	86	201	768
	Total	801	768	767	766	772	759	762	764	763	758	-

How do you feel about comfort of cycling? Are you satisfied with the following items -

#	Question	dissatisfied	less satisfied	rather dissatisfied	very satisfied	completely satisfied	Total Responses	Mean
10	availability of dedicated lanes for cycling	120	247	95	4	5	471	2.49
11	width of cycle lanes	163	216	83	8	1	471	2.18
12	the quality of road surface of the cycle lanes	163	194	100	12	2	471	2.32
13	the way other road users treat cyclists when on mixed use roads	154	191	108	14	4	471	2.47
14	signposting of directions and destinations for cycling	186	166	94	19	5	470	2.29
15	lighting of cycling facilities and urban streets at night	210	144	105	9	3	471	2.09
16	number and the location of cycle parking facilities in the city	120	255	86	9	1	471	2.43
17	security of the cycle parking facilities	162	203	88	13	5	471	2.32

9.7 I-Bike Indore

iBike Bicycle Sharing for Indore

- Bicycles can be picked up at any self-serve bike-station and returned to any other bike station
- People need to fill the memberships form by depositing Rs. 500 (Rs. 200 non refundable deposit fee & Rs. 300 is usable rental amount) to avail the facility.
- As soon as KYC is completed, one becomes the member of Ibike and would be allotted a Unique ID.

- 15 min usages 4 times a day is FREE. Usage above 15 min is Chargeable at Rs.10 per hour
- Person would be given password(s) to unlock and lock the cycle at pick up and drop off stations.
- Stations are designed in such a way that, they are located in close proximity to one another, as well as to major transit hubs and are placed in both residential/commercial/manufacturing neighborhoods.
- The I-bike is currently being implemented at 11 locations across the city –
    - Vijay Nagar (Near R.T.O. Office)
    - Satya Sai Square
    - B.C.M. Heights
    - Rasoma Square
    - M. R. 9 Square
    - Shalimar Township
    - Brilliant Convention Center (Near Water Tank)
    - Scheme No. 54 (Near Narmada Tank)
    - Meghdoot Garden (In between Hotel Sayaji and Meghdoot Garden)
    - Bapat Square
    - L. I. G. Square
- All these bike stands have been planned such that they are in vicinity of either I-bus or a city bus stand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9.8 BRTS Benefits

How do you feel about the BRTS? Are you satisfied with the following items:

#	Question	dissatisfied	less satisfied	satisfied	very satisfied	completely satisfied	Total Responses	Mean
38	Accessibility of the public transport vehicles, stops and stations	68	189	344	91	19	711	4.31
30	Availability of seats	70	166	349	98	28	711	4.47
35	Buggy space available	61	233	320	86	9	709	4.11
29	Cleanliness	62	103	414	90	42	711	4.81
31	Comfort (seats, noise, temperature)	54	95	413	110	39	711	4.95
37	Comfort of stops whilst waiting (seats, lighting, shelter)	48	168	394	80	21	711	4.50
34	Easy ticketing	40	106	450	86	28	710	4.85
32	Fare	57	87	439	93	35	711	4.87
40	Feeling secure using public transport	58	88	414	96	55	711	5.01
33	Real time information (routes, timetable and delays)	68	163	396	66	16	709	4.29
39	Safe vehicles	60	97	428	92	34	711	4.80
36	The punctuality of the public transport	68	142	406	76	19	711	4.42

Statistic	Cleanliness	Availability of seats	Comfort (seats, noise, temperature)	Fare	Real time information (routes, timetable and delays)	Easy ticketing	Buggy space available	The punctuality of the public transport	Comfort of stops whilst waiting (seats, lighting, shelter)	Accessibility of the public transport vehicles, stops and stations	Safe vehicles	Feeling secure using public transport
Min Value	0	0	0	0	0	0	0	0	0	0	0	0
Max Value	10	10	10	10	10	10	10	10	10	10	10	10
Mean	4.81	4.47	4.95	4.87	4.29	4.85	4.11	4.42	4.50	4.31	4.80	5.01
Variance	5.33	5.49	5.08	4.81	4.48	4.07	4.50	4.65	4.36	5.05	4.93	5.60
Standard Deviation	2.31	2.34	2.25	2.19	2.12	2.02	2.12	2.16	2.09	2.25	2.22	2.37
Total Responses	711	711	711	711	709	710	709	711	711	711	711	711

9.9 List of attendees during various stakeholder consultations

			July 24 and 25 - 2014	17-Nov-14		Feb 17 & 18-2015			July 27 & 28 - 2015			7-Oct-2015	
Name of the department	Contact Person	Designation	Stakeholder	Stakeholder	Steering Committee	Pilot Stakeholder	Core	Steering Committee	Pilot Stakeholder	Core	Steering Committee	Core	Steering Committee
	Mr. Rakesh Singh	Municipal Commissioner			X			X					
Indore Municipal Corporation	Mr. Manish Singh	Municipal Commissioner											
	Mahesh Sharma	EE		X	X								
	Mr. Harbhjan Singh	City Engineer	X										
	Mr. N.S. Tomar	SE, IMC				X							
	Geeta Arora	EE							x	x	x	x	
	Diwakar Gaadre	Zonal Officer, IMC				X			x	x	x		
	Satish Gupta	IMC-SE										x	
Atal Indore City Transport Services Limited	Mr. Sandeep Soni	CEO	X	X	X	X	X	X	x	x	x	x	x
	Mr. Rahul Shrouti	Technical Manager		X	X				x	x	x	x	x
	Ms. Mala Singh Thakur	PRO & Manager HR	X	X	X	X	X	X	x				x
	Jatin Sharma	OE							x	x	x	x	x
	Sandeep Trivedi	Operation Manager							x	x	x	x	x
	Jagjeet singh Rajpal	Field Officer							x	x		x	x
	Chetan Kaushik	Field Officer							x	x		x	x
	Md. Arif	Accounts							x				
	Md. Irfan	Manager-Finance										x	x
	Mr. Deepak Singh	ADM Indore & member AICTSL-Speaker									x		
Regional Transport Officer	M P Singh	RTO Indore and special invitee member AICTSL											
	Mohammad Logre	RTO Inspector-Inspector										x	
	Shri Sanjay Soni	Regional Transport Officer(RTO)											
District Administration Indore	Shri Akash Tripathy	Collector			X			X					
	Shri P. Narahari	Collector									x		x
	Amita Kunothe	DD							x	x	x		
	R Nagal	JD							x				
	Vijay Darya	TFCP, D.M										x	x

	H.S Gawali	Asst. Director			X									
Traffic	Mr. Vikram Singh Raghuwanshi	DSP traffic, Indore police	X	X	X									
	Miss Anjana Tiwari	Addl. SP (Traffic)			x			x						
	Mr. Pankaj Shrivastav	Addl. SP (Traffic)							x		x			x
	Mr. Vijay Singh Pawar	DSP (Traffic)												
Indore Development Authority	Anil Chugh	Executive Engineer, IDA	X	X		X								
	Shri Rakesh Singh	CEO-IDA			X			X						
	Anoop Dhaketa	Executive Engineer	X											
	Shekar Pamecha	AE		X		X			x	x	x			x
	Ashok Samir	S/E		X								x		
	Rakesh Agrawal	AE		X								x		
	Herald Hassy	S/E		X										
	Shri Prabhat Parashar	Chairman												
	Shri K.K.Maheshwari	CE												
	Mr. Kapil Dev bhalla	Asst. Engineer				X								
	CP Moondre	IDA	X											
	M.K. Bobade	AE							x	x	x	x		
	Mr. Anil Joshi	Executive Engineer				X								
Urban Administration & Development	Mr Kamal Nagar	Dy Director, UAD												
	Mr Sanjay Kumar Shukla	Commissioner, UAD												
	Mr S N Mishra	Principal Secretary – UAD												
University	Dr Ashish Verma	Assistant Professor	X	X	X				x	x	x			x
	Prithvi Bhat	Research Associate	X	X	X									
	Sandeep Narulkar	Professor SGSITS, Indore		X	X	X	X		x			x		
	Prof. O.P. Bhatia	Retd. Prof.												
EMBARQ India	Umang Jain	Senior Project Associate		X	X				x	x	x			x
Ford Motor Company	John Viera	Director, Sustainability	X			X	X	X				x	x	
	Shelley Thomopoulos	Sustainable Mobility		X	X				x	x	x			
	Ganesh Ramakrishnan	WBCSD	X	X	X	X	X	X	x	x	x	x	x	
	Dr. Shripad Bhat	Country Director	X	X	X	X	X	X	x	x	x	x	x	
	Verma Mantena								x	x	x			
	Uma DeBose		X											
WBCSD	Michael Fahy	Director, SMP2.0	X	X	X	X	X	X	x	x	x	x	x	
	Joe Phelan	WBCSD Asia		X	X							x		
	Santosh Agrawal	WBCSD Indore				X	X	X	x	x	x	x	x	

	Sophie Roizard	WBCSD								x	x	x		
	David Berdish	WBCSD Research								x	x	x		
Consultant	Ridhima Kapur									x	x	x		
VW	Joerg Bouzek	Powertrain Director	X	X										
Fujitsu	Nitin Sandeep	Manager		X		X	X	X						
	Hiroki Akiyama	Sales Head								x	x	x		
	Varun Gakhok		X											
Feedback Brisa	Alok Bhardwaj		X											
	Jaishree Jindel	Manager-BD								x	x	x	x	x
BMW	Vinod Pandey	GM	X			X	X			x	x	x	x	x
Pilot Stakeholders	Kishor Deepak Kodwani	Vikas Mitra Drishti – 2050				X	X			x				
	Amit Agrawal													
	pan	Secretary, Varishti Nagrik				X								
	Ajit Agrawal	President, Manch Indore				X								
	Shailendra Somel	Reporter, Lokswamai SRMP				X								
	Neeraj Jategaonkar	Operator, iRide (Rental two wheeler)				X	X			x	x		x	
	Dr. Prafulla Joshi	Director, Save Life Cycle				X				x	x			
	Deepak	ICRIER, Delhi (NGO on Sustainable Development)				X	X							
	Kapil Tankha	Serco (I) Pvt. Ltd., Contract Manager				X	X							
	Iftekhar Munna Ansari	CEO, Priya Dharshini Transports services				X				x	x			
	Sufyam Ansari	Priya Dharshini Transports services				X				x	x			
	Rakesh Gandhi	Proprietor, Kanakshree				X								
	H.R. Pandey	S/E, IMC				X								
	S.H.Haryani	Secretary				X								
	Vinod Dhonkhar	Serco (I) Pvt. Ltd., Maint. Manager				X	X						x	
	R. Dhanwani	President, Hardware shop Association				X								
	Ismail					X								
	Ankit Chowksey	Manager-Perfect Transport				X				x				
	Ankit Soni	AICTSL-Trainee								x	x	x		
	Jitendra Jadhar	Manager - All India Trades				X								
	Dharmendra	Drirector-Perfect Enterprise				X								
	Iftekhar Rajindra Chordia	Owner Balaji Illuminations				X								

	Sanjay Dubey	Commissioner – Indore Division												
	Santosh Agrawal	Ex. CGM-City Bus		X										
	Roshan Agrawal	Director-Chartered Speed PVT LTD.		X					x					
	Karanvir Singh	CEO-TeleRickshaw	X	X					x	x	x			
	Siddhart Mehta	TeleRickshaw							x					
	Ashray Aggarwal	TeleRickshaw							x					
	Arshi Klan	Nafees Trarcls	X											
	R.C. Verma		X											
	Dr. B. H. Singh	PRO			X									
	S.M. Bhople	Manager - Serco							x					
	Amit Jain	Accounts - Serco							x					
	Brijmohan Rathi	Bus Operator								x				
	Sandeep pare	Sr. Reporter-Patrika							x	x	x			
	Milish Jain	Director							x					
	Amitabh Bajpai	President - iBike							x					
	Harmandeep	sub-Coordinator							x					
	Palvinder	Chief-Coordinator							x					
	Jaydeep K P	CEO-iBike							x					
	Arvind Jain	Sarafa							x					
	Surya	sales-Coordinator							x					
	Rizman Ansari	Operator							x					
	Deepak Magar	CGM-Prasanna Purple							x			x		
	D.K. Joshi	Main. Mgr- Prasanna Purple							x					
	Shivaji Mohite	Akhiyas Mandal							x					
	Dr. Gautam Kothari	President of pithampura							x					
	Prince Agrawal	Urban Planner							x					
	Lavleen Upasak	Urban Planner							x					
	Anil Durve	Reporter							x					
	Ram S Pal	Reporter-Rajexpress							x					
	Kamleshwar Singh	Reporter-Swadesh							x					
	Girish Sharma	Nobel							x					
	Ajitesh bh sharma	Director							x					
	K. P. Singh	MD-Shouryaditya							x					
	Kuldeep	Cyber Infra-Free as air							x					
	Hemant	Cyber Infra-Free as air							x					
	Vinit	Correspondent							x					
	Pallavi Nair	Correspondent							x					
	Sekhar	Reporter-H.B.TV							x					

	Parkaram Singh	Mitra drop							x						
	V K Gupta	CEO							x						
	Dr. Sudha Jain	ISSW							x						
	Jagatnarayan joshi	Socual activist							x						
	Zia Ur Rahman Shibu	Priyadarshini - GM											x		
	Kiran Kaose	Transit TV-National Head											x		
	Nitin Kale	Transit TV-Manager											x		
	Piyush Geete	AICTSL-Supervisor											x		
	Amit Paul	AICTSL-BRTS Supervisor											x		
	Jasdeep Singh	NMT ecorides-Director											x		

Disclaimer

This publication is released in the name of the WBCSD and its partners. Like other WBCSD publications, it is the result of a collaborative effort by members of the secretariat and senior executives from several member companies and partner organizations. A wide range of members and partners reviewed drafts, thereby ensuring that the document broadly represents the majority view of the WBCSD membership and the partners. It does not mean, however, that every member company and every partner organization agrees with every word.

The Sustainable Mobility Project 2 is an integrated, holistic approach to sustainable urban mobility challenges aiming at adding objectivity, clarity and transparency to sustainable urban mobility planning policy and decision making. It is a process open for the benefit of any governmental regional or municipal authority, as well as any business, that wish to adopt it and put into practice.

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