

Review Of Performance Indicators Of Smart Cities In India – Ease Of Living Index: A Case Of Jabalpur Smart City

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Abstract: The objective of the paper is to understand the measurement approach of 'Ease of Living' concept of Smart Cities in India under the Smart City Mission with sample case of city of Jabalpur of Madhya Pradesh. The city Jabalpur was a surprise selection under the smart city mission and holds good rank in 'Ease of Living' index results. The study is to explore impact in ground realities as observed in the index results in weakest and strongest sector of city services. In this study, it was observed that Ease of Living Index has few gaps in measuring the situation.

Index Terms: Smart City, Smart Cities India, Smart Cities Mission, Ease of Living Index, Liveability Index, Performance indicators of Smart Cities India, Jabalpur.

1. INTRODUCTION

A variety of concepts come up as we discuss Smart Cities in India. There are different views as there is no one definition (Housing and Urban Development Ministry, India, 2017) under Smart Cities Mission. But there is one index of performance of cities in the Mission. Three aspects were pivotal for the development of 'Ease of Living' parameters to track progress in Smart Cities under the mission: -

- Sustainable Development which is addressed through tailor-made parameters.
- Coordinated and efficient management of City Services. Electronic integration with availability of data to establish processes in place.
- Planning on priority projects with clarity on fund arrangements from the proposed projects to economically sustain the projects.\

2. OBJECTIVE

The objective of the paper is to understand the measurement approach of 'Ease of Living' concept of Smart Cities in India under the Smart City Mission with a sample case.

3. RELEVANCE OF STUDY

The smart city in India is being measured by performance of city and the Smart City Mission contributes to betterment of city performance through various means. The mission can be broadly divided into two parts:

- New development under Area Based Development or Greenfield Development and
- Overall improvement of city infrastructure via Pan City Projects.

In both of these cases it is difficult to measure the progress and consequences of the projects undertaken. So, there are three aspects that concern us in the measure of 'Performance of the Smart City', namely

1. Measure of performance of smart city as per mission

guidelines.

2. Choices of projects and future of city
3. The informal systems and practices in city administration.

The third aspect is most critical as it brings up lack of certainty in above two. It is also one of the most crucial reason because of which data is not available in most of the government offices.

4. METHODOLOGY

In this study we have first understood the smart city model and analysed it. Then we have analysed the rating system and how it is being done. The government had studied ease of living index in a city which has been completed by us by studying each indicator. We have recorded all the issues and our observation about the indicators. Then we have analysed the weakest and strongest sector to understand the current situation. Then we have observed the impact of ease of living indicator rating on the ongoing projects. The paper is primarily limited to 'Governance' aspect in Smart City Mission in India. A multi-level enquiry with systematic survey, interviews, public and expert consultations, study of Indian Smart City Mission and practical application in a city, study of international Smart City programs, study of different models of smart city suggested by experts and practitioners. The data from website of mission program was used for quantitative methods. The official documents and proceedings were documented through interactions in various offices for getting the official data for measure of Ease of Living Index.

5. DETERMINANTS OF EASE OF LIVING INDEX

Measure of Smart City: The index exercise was launched in January 2018 by Ministry of Housing and Urban Affairs (MoHUA) with help of the consortium of IPSOS Research Pvt Ltd, Athena Info omics, and Economist Intelligence Unit (EIU). But before understanding the measure of Smart Cities in India, we need to understand its context and point of perspective in comparison to other indicators, rather than direct measure of goodness of Smart City Projects. Smart City has many definitions, for sake of discussion; it is assumed in this paper that smart city concept has following key aspects (Tomer et al. 2014)

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- Smart Cities begin with an economically-driven, technologically-focused vision
- A successful city specific vision which must address three key economic drivers, productivity, inclusivity and resiliency
- Cities must reform government to successfully implement their economic vision
- Cities must balance the relationship between project scale and risk tolerance
- Cities require stronger networks and improved communication tool. [1]

5.1. Relevance of Determinants of Ease of Living Index

Liveability can be measured by measure of 'Standard of Living' or 'Quality of life'. MoHUA's Liveability Index combines elements of both approaches. Standard of Living can be measured by Level of material goods and necessities available to a certain socio-economic class in a certain geography measured through Income, Wealth, Consumption and flourishing economy. Ease of Living Index is calculated with critical indicators and is aimed to ease planning decisions as it gives status of various goals in a city

- Good Health – 10 indicators
- Quality Education – 6 indicators
- Clean Water and Sanitation – 12 indicators
- Good Jobs and Economic Growth – 8 indicators
- SDG goals - Sustainable Cities and Communities – 30 indicators
- Peace and Justice – 7 indicators
- Partnership for Goals – 2 indicators

There are various measures as indicators for ranking the programs based on objectivity and purpose. Policies, human resources, materials, financial resources are compiled in the CDP. India has 40 cities with more than a million people, 397 cities with between 100,000 and 1 million people, and over 2500 cities with between 10,000 and 100,000 people. [2] CDP is a concept evolved out of Jawaharlal Nehru National Urban Renewal Mission (JNNURM) for listing city vision, financing and project implementation work but with no statutory backing. Output indicators are measure of quality and quantity of output of the activity. CITYkeys marks following as output indicators: online services, number of open datasets; quality of open datasets; number of innovation hubs in the city. Service Level Benchmarking (SLB) is a type of Output Indicator with documentation on tangible attributes of the program which has been developed to

- To identify a minimum set of standard performance parameters for the water and sanitation sector that are commonly understood and used by all stakeholders across the country; [3]
- To define a common minimum framework for monitoring and reporting on these indicators and
 - To set out guidelines on how to operationalise this framework in a phased manner. [4]

The ULBs are at the forefront of this shift, based on the decentralisation agenda articulated under the 74th Constitutional Amendment. The scheme for the disbursement of Performance Grant was revised by MoUD keeping in mind the transformational urban reforms.

Table 1: Indicators in Service Level Benchmarking

INDICATORS			
Water Supply	Storm Water Drainage	Sewage Management	Solid Waste Management
Coverage of water supply Connections	Coverage of storm water drainage network	Coverage of toilets	Household level coverage of solid waste management services
Per capita supply of water	Incidence of water logging/ flooding	Coverage of sewage network services	Efficiency of collection of municipal solid waste
Extent of metering of water connections		Collection efficiency of the sewage network	Extent of segregation of municipal solid waste
Extent of non-revenue water		Adequacy of sewage treatment capacity	Extent of municipal solid waste recovered
Continuity of water supply		Quality of sewage treatment	Extent of scientific disposal of municipal solid waste
Quality of water supplied		Extent of reuse and recycling of treated sewage	Efficiency in redressal of customer complaints
Efficiency in redressal of customer complaints		Efficiency in redressal of customer complaints	Extent of cost recovery in SWM services
Cost recovery in water supply services		Extent of cost recovery in sewage management	Efficiency in collection of SWM charges
Efficiency in collection of water supply-related charges		Efficiency in collection of sewage charges	

5.1.1. Outcome Indicators

Outcome indicators scale, quality and quantity, of spread of the program. CITYkeys mentions following as outcome indicators: access to high speed internet; people reached by the project. Following are some outcome indicators from various organisations,

Table 2: Methodology by various Organisations for computing Smart City Rankings.

Organisation	Smart City Ranking Methodology
Fast Co Exist	City rankings in Innovation, Quality of Life, Sustainability, Digital Community and Digital Governance
Institution of Mechanical Engineers (IMechE)	Smart City Initiative, Innovation, Indigenous Development Strategies, Sustainability
ACCIONA (Sustainability for All)	Governance, Urban planning, Public management, Technology, environment, International projection, Social cohesion, Mobility and transportation, Human capital and economy
Institute of Information Sciences, Shanghai Academy of Social Sciences	Internet space, Physical space, Economic space, Digital creativity, Content originality, Smart service, Smart management
Global Smart City – 2015 (Juniper Research)	Use of smart grids, smart traffic management and smart street lighting, alongside aspects such as technological

capability and social cohesion, among others.

Source: CSTEP Analysis, Center for Study of Science, Technology and Policy, Bengaluru, Karnataka, INDIA www.cstep.in [5]

5.2. Various Measures of Liveability Index

5.2.1. Economist Intelligence Unit

(EIU)one of the most comprehensive Liveability rating agencies, as it transparently and scientifically weighs up Liveability on five broad parameters of stability, healthcare, culture and environment, education, and infrastructure. Cities are rated as acceptable, tolerable, uncomfortable, undesirable or intolerable. [6]

Table 3: Indicators in EIU Index of Liveability [7]

Economist Intelligence Unit				
Stability (weight: 25% of total)	Healthcare (weight: 20% of total)	Culture & Environment (weight: 25% of total)	Education (weight: 10% of total)	Infrastructure (weight: 20% of total)
Prevalence of petty crime EIU rating Prevalence of violent crime EIU rating Threat of terror EIU rating Threat of military conflict EIU rating Threat of civil unrest/conflict EIU rating	Availability of private healthcare EIU rating Quality of private healthcare EIU rating Quality of public healthcare EIU rating Availability of over-the-counter drugs EIU rating General healthcare indicators Adapted from World Bank	Humidity/temperature rating Adapted from average weather conditions Discomfort of climate to travelers EIU rating Level of corruption Adapted from Transparency International Social or religious restrictions EIU rating Level of censorship EIU rating Sporting availability EIU field rating of 3 sport indicators Cultural availability EIU field rating of 4 cultural indicators Food and drink EIU field rating of 4 cultural indicators Consumer goods and services EIU rating of product availability	Availability of private education EIU rating Quality of private education EIU rating Public education indicators Adapted from World Bank	Quality of road network EIU rating Quality of public transport EIU rating Quality of international links EIU rating Availability of good quality housing EIU rating Quality of energy provision EIU rating Quality of water provision EIU rating Quality of telecommunications EIU rating

5.2.2. Mercer Liveability Index

Mercer’s Quality of Living Reports offer around 500 city analysis on various aspects under ten factors, Recreation, Public services and transport, Socio-cultural environment, School and education, Medical and health considerations,

Political and social environment, Natural environment, Housing, Economic environment & Consumer goods availability.

5.2.3. OECD Liveability Index

The Organisation for Economic Co-operation and Development (OECD) includes indicators covering Housing, Income, Jobs, Community, Education, Environment, Civic Engagement, Health, Life Satisfaction, Safety and Work-Life Balance.

Table 4: Comparative Analysis of importance given to various Indicators in Liveability & Smart City Mission Indices provided by various Organisations

Themes	EIU	Mercer	OECD	BIS	MoUD
Safety	5	4	2	5	4
Health	6	8	2	7	4
Education	3	1	3	5	4
Recreation	1	4	-	2	3
Socio-Cultural	4	2	4	-	3
Governance	1	1	2	6	4
Economy	-	2	6	10	3
Transportation	3	3	-	7	12
Housing	1	3	3	3	2
Consumer & Good Services	2	5	-	-	-
Physical Infrastructure	2	4	-	29	18
Energy	1	-	-	5	5
Natural Environment	1	2	2	9	3

Source: Exploring Liveability as a dimension of Smart City Mission (India) Authors -Aman Randhawa and Dr. Ashwani Kumar, International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 04 Issue: 11 | Nov -2017 www.irjet.net p-ISSN: 2395-0072 © 2017, IRJET [8] The concept of ‘Ease of Living’ has its indicators deeply rooted in Sustainability Index as it is set around the Sustainable Development Goals, which replaced the Millennium Development Goals in 2015, and aims at, to end poverty, protect the planet and ensure prosperity for everyone. Each goal has specific targets that need to be met by 2030. [9]

6. EVOLUTION OF ‘EASE OF LIVING’ AS INDEX IN SMART CITY MISSION IN INDIA

Launched in 2015, the Smart City Mission aspires to develop cities that will “provide core infrastructure, a decent quality of life to its citizens, clean and sustainable environment and application of Smart Solutions”. [10] The driving forces of city planning are pivoted upon competitiveness and sustainable development in the urban areas. On the lines of evaluation of Smart Cities India, the first official document is the ‘Exploratory Research on Smart Cities’ by PEARL, framed in 2014. The reports submitted by competition cities were made up of high-tech buildings and streets financed through investment options. It was found that most of the cities, unlike the intent of the mission, had least focus on city specific ‘issue resolution development models. Since then Bureau of Indian Standards BIS had attempted means to establish the structure for the Smart Cities Framework. The document had consistent focus on conditions of Indian situations, Indian needs and needed action. The BIS team gave a set of 46 core and 47 supportive indicators to

establish national standards for smart cities. These included indicators on economics, education, energy, environment, health, governance, transport, shelter and safety, pollution, renewable energy consumption, the unemployment rate, the ratio of police personnel to population, and the infant mortality rate. [11] So, to not to complicate the mission, in the year 2016, government of India devised 'Liveability Index' as measure of goodness of Smart City. The key aspect 'Sustainable Development' was maintained in 'Liveability Index' but ICT was completely diluted.

6.1. Objective of Ease of Living Index

- The index has two major expected outcomes
- Index must catalyse actions to improve the quality of life in Indian cities.
 - Assess outcomes achieved from various urban policies and schemes, addressing data gaps.
 - Enhance city-level decision making
 - Shaping local electoral discourse
 - Serve as a basis for dialogue with citizens and urban decision-makers
 - Improve access to resources transparently linking resourcing to facilitate learning and capacity building

'Ease of Living Index', was calculated on the basis of data provided by Smart City Cells referencing the national standards. The cities were measured on a hundred-point scale across 78 indicators on the following factors with weightage they carry, in points:

- Institutions and governance 25 points
- Social infrastructure carrying 25 points
- Economic factors 5 points
- Physical infrastructure 45 points

The pillars are further broken down into categories, which are fifteen in all. The index follows the Dimensional Index Methodology and is thus, promoting urban planning and management on a competitive scale. Governance takes the major share in the index. Governance Pillar with major share of 25%, there is a 3.125% weightage to each one of following indicators: -

- Percentage of citizen services available online
- Percentage of services integrated through Command Centre
- Percentage of citizens using online services
- Average delay in grievance redressal
- Tax collected as percentage of tax billed
- Extent of cost recovery (O&M) in water supply services
- Capital spending as percentage of total expenditure
- Percentage of population covered under Ward Committees/ Area Sabhas
- Committees/ Area Sabhas [12,13]

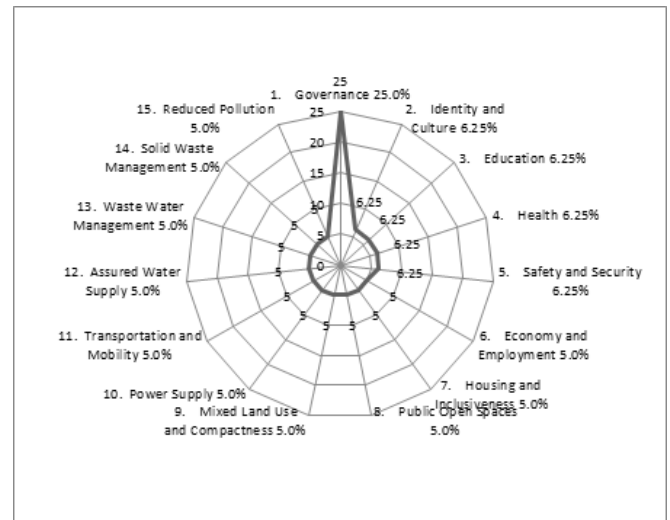
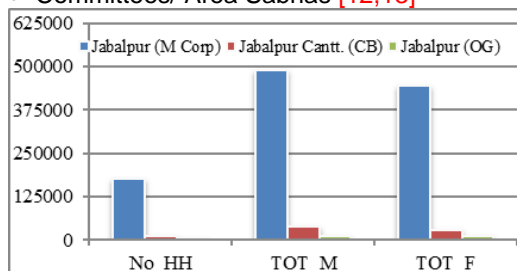


Figure 1: Categories with Percentage share in Ease of Living Index Score

Table 5: List of 16 indicators within Governance Category in Ease of Living Index [12]

Indicators in Governance Pillar	Measure
1.1 Percentage of citizen services available online	Number of citizen services available online
	Total number of citizen services provided by the ULB
1.2 Percentage of services integrated through Command Centre	Number of services integrated through singular operations Centre
	Total number of services provided by the ULB
1.3 Percentage of citizens using online services	Average for all citizen services
	Number of registered users using online services in a month
1.4 Average delay in grievance redressal	Average redressal period for a service
	Committed redressal period for the service
1.5 Tax collected as percentage of tax billed	Total tax collected in a year
	Total demand raised for the year
1.6 Extent of cost recovery (O&M) in water supply services	Total collection of user charges in water supply in a year
	Total O&M cost for providing water supply services during the year
1.7 Capital spending as percentage of total expenditure	Total capital expenditure during a year
	Total expenditure (revenue and capital accounts) in the same year
1.8 Percentage of population covered under Ward Committees/ Area Sabhas	Population covered under ward committees/ area sabhas
	Total population of the city

6.2. Calculation of Ease of Living Index - The Framework

Step 1 – Converting stages of progress to scores: For a given city, the stages of progress identified across the various Liveability Standards will be scored as per the scoring table 6 given below:

Table 6: Stages of progress under Liveability Standards

Stage 1	Stage 2	Stage 3	Stage 4
<50% of benchmark	≥50 < 75% of benchmark	≥75 < 100% of benchmark	Benchmark achieved
Score: 0	Score: 0.5	Score: 0.75	Score: 1

Step 2 – Calculating Category Indexes: The scores for all Core and Supporting Liveability Standards in each category will be averaged to calculate the Category Indexes. Core standards will have 70% weight and supporting standards will have 30% weight. Thus, Category Index= (Average for core standards * 0.7) + (Average for supporting standards * 0.3).

Step 3 – Weight adjustment of Category Indexes: Four pillars of comprehensive urban development have been identified under the Smart Cities Mission Guidelines, namely Institutional, Social, Economic and Physical. The 15 Category Indexes can be organised under these pillars as indicated in the diagram. Relative weights have been assigned to each of these pillars as per table 7 given below:

Table 7: Pillar weightage under Liveability Standards

Institutional	Social	Economic	Physical
30%	20%	5%	45%

The weights have been assigned depending upon the extent to which, City Governments can actively make improvements in the parameters/standards. For instance, broader outcome areas such as economic development cannot be influenced by the actions of City Governments alone and have therefore been assigned the lowest weight.

Step 4 – Calculating City Index: Index= (Average for Institutional Category Indexes * 0.3) + (Average for Social Category Indexes * 0.2) + (Average for Economic Category Indexes * 0.05) + (Average for Physical Category Indexes * 0.45).

Step 5 – Ranking of Cities: Inter-City ranking sheet will be prepared for the various Category Indexes (step 2) and the overall City Liveability Index (step 4).

Table 8: Computation of indicators with weight adjustments in Ease of Living Index

CITY	Institutional (30% weightage)	Social (20%)				Economic (5%)	Physical (45%)								
	Governance	Identity and Culture	Health	Education	Safety	Economic	Compact Development	Water	Energy	Waste Water	Solid Waste	Housing	Open Space	Mobility	Pollution
City Name	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
Average	A	$R = \frac{B+C+D+E}{4}$				F	$S = \frac{G+H+J+K+L+M+N+P+Q}{9}$								
Weightage	$T = A * 0.3$	$U = R * 0.2$				$V = F * 0.05$	$W = S * 0.45$								
CITY INDEX= T + U + V + W															

Source: Ease of Living Index 2018, [12] <http://smartcities.gov.in/upload/uploadfiles/files/MethodologicalReportFinal.pdf>

7. REVIEW OF EASE OF LIVING INDEX OF A SMART CITY, INDIA

The methodology is simple and evaluation reviews are based on study and analysis of city and the index. The review is centered at the core concern, governance, which happens to be the priority pillar of the index.

- Evaluation of Index
- Evaluation of method
- Evaluation of impact

7.1. Introduction of Jabalpur Smart City

The smart city mission was launched on 25th June 2015. 100 cities were identified, in 4 rounds, with Jabalpur (7th rank), Indore (11th) and Bhopal (20th) being selected in the list of first 20 cities. Jabalpur at seventh position was a surprise. It has a comparatively lower percentage of its total population living in the urban areas in the state as compared to other states. At planning level, SCM was convergence of Swachh Bharat Mission (SBM), Atal Mission for rejuvenation and Urban transformation (AMRUT), Heritage City Development and Augmentation Yojana (HRIDAY), Digital India, Education Training & Skill Development, 'Housing for All' (through Madhya Pradesh Housing Board in Jabalpur), and Projects under Private Public Participation (PPP). And the mission statement was not about projects but about the vision for the city development contained in those projects and the 'Ease of

Living' Index creates a format to measure that on the basis of desired outcomes of good development in a city. Citizen health, garbage dumping on roads, slums in low lying areas, poor implementation of master plan and unorganised transportation are some of the major issues of the city of Jabalpur. This part of the paper evaluates index results and situation.

Table No. 9: Position of Jabalpur city in Smart City Mission selection results

Rank	Name of State/UT	Name of City	Score (%)
1	Odisha	Bhubaneswar	78.83
2	Maharashtra	Pune	77.42
7	Madhya Pradesh	Jabalpur	63.03
11	Madhya Pradesh	Indore	59.89
12	Delhi	NDMC	59.63
18	Tamil Nadu	Chennai	56.16
20	Madhya Pradesh	Bhopal	55.47

7.2. City Status in Ease of Living Index Results

Ease of Living Index was released by Ministry of Housing and Urban on 13th August 2018.



Figure 2: National launch of the results on 13th August 2018

In the premier Ease of Living Index, mid-size cities with population in the range of 1-4 million performed the best overall. Smaller cities underperformed, apparently on account of large infrastructure spending and gap in effective data collection and management. Jabalpur stands all India 15th rank with Ease of Living Index as 46.78.

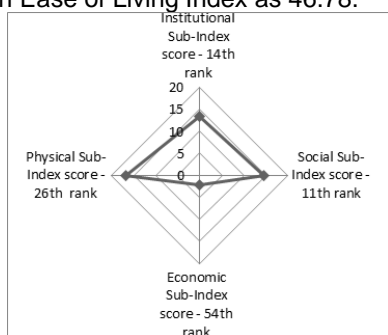


Figure 3: Sub-Index scores of Jabalpur City for four pillars with respective all-India rank

Stage I - Evaluation of Index was done to check the city status and index results in context of Governance Pillar. A comprehensive study of ground situation was done, from office to office and methods and means of meeting goals and deliverables were observed. The system of electronic working is quite evident in Municipal Corporation but it is nowhere near the excellence mark in e-governance.

Jabalpur City Development Plan documents following on governance in Jabalpur:

- The interdepartmental coordination in JMC is low. The interdepartmental knowledge transfer is not in practice.
- There is lack of implementation of Master Plan and Traffic rules. There is lack of facilities. A dynamic physical assessment and maintenance plan for the municipal asset should be prepared. The land potential should be harnessed for improving the revenues.
- Public involvement both in consultation and development should be encouraged.

From the fact that 'Ease of Living' indicator wants to facilitate a dialogue between public and administration, it needs to be known and understood by the citizens.

7.3. Measure of smart City – Governance

GOVERNANCE INDEX= (Average for core standards * 0.7) + (Average for supporting standards * 0.3)

PERCENTAGE OF CITIZEN SERVICES AVAILABLE ONLINE= (Sum of B) / (Sum of A) * 100 % = 75.49

Sources: E Nagar Palika App, JMC website, Jabalpur 311 app, Swachhta app [14]

8. EVALUATION OF METHOD - COMPUTATION OF INDICATORS –

For calculation of the index there are over systematic 500 different data required from over 50 sources for computing 79 indicators. Accessibility is an issue due to lack of proper Data collection and Management policy/guideline for internet-based platform of government/or public bodies it is hard to ensure data availability in a form that it can be interpreted. There were following major issues in data required:

- As city infrastructure is being assessed, there are cases of duplication of the datasets in the Ease of Living assessment due to various reasons. Integrated Command and Control Centres (ICCC) are gradually coming up with convergence of services and complaint redressal through use of IT, integrating ULB, Police, Health (Hospital), Fire etc., but still not having the information expected. Green building rating is done after the construction and by different agencies and Municipal Corporation is not bound to keep the records. Percentage of total energy derived from renewable sources cannot be appropriately tracked. The required data of some department are not available at the city level and available at state level.
- System of maintaining the record of data is not the same as that required for computation of index.
 - ✓ Percentage of interchanges with bicycle parking facilities is a vague gauge in a city like Jabalpur
 - ✓ Record of the drains is not available in terms of primary, secondary and tertiary classification.
 - ✓ Data sources mentioned in the methodology is not same throughout the country in different states.
 - ✓ Total number of intersections with pedestrian crossing facilities on major roads is sought but major road is not defined.
 - ✓ What all are the uses included in reuse and recycling is not specified under extent of reuse and recycling of waste water.
 - ✓ Use of water is not specified to know the prescribed standards in indicator.
- There are incidences of lack of data, and data not collected by the concerned authority, or the expected source is not elaborate or exhaustive.
 - ✓ Like, Rashaan Cards are being issued to each household. There is no real time monitoring of this data.
 - ✓ No proper management of record of proceedings of meetings of ward committees' members,
 - ✓ Non availability of Records of unprotected historic buildings, lack of track of current use/condition of historic buildings, no specific rule for reuse / restoration/ demolition of unprotected historic monuments.
 - ✓ No record is maintained for number of cultural/sports events hosted by city.
 - ✓ Age group wise population of students enrolled in schools is not available.
 - ✓ There is no proper record of Health infrastructure and practitioners in the city.
 - ✓ There is no record of vendors registered and formal spaces provided to them.
 - ✓ No record of privately-owned recreational places.
 - ✓ No updated record of existing land-use.

- ✓ No updated data on mode share of non-motorised transport.
- ✓ No record of implementation of rainwater harvesting
- ✓ Coverage of toilets is assessed on the basis of some surveys.
- ✓ The concern for universal accessibility in public rights-of way is alarming with lack of awareness, and there is no evident implementation of universal design principals in the city.
- ✓ All services are not displayed in Citizen Charter.
- ✓ Tax collected data is not appropriate
- ✓ There is no collection of occupancy and nature of occupancy data from the hotels.
- The indicators track the available data rather than the system correctness.
 - ✓ Like due to ignorance of public and lack of efficient closure report of CM helpline application, proper and reliable data is not available.
 - ✓ Extent of cost recovery (O&M) in water supply services is a measure of Tax collection, which is on monthly basis and not efficient.
 - ✓ ULB does not allocate funds from municipal budget, and funding is done through sponsorship.
 - ✓ Percentage of school-aged population enrolled in schools includes students from rural area enrolled in the city school.
 - ✓ Installation data on is available for surveillance, in terms of number of streets, public places, junctions covered through surveillance systems but not on the status of fitness of cameras etc.
 - ✓ Under 'Number of recorded crimes per lakh population', incorporation of efficiency of crime reporting is lacking in the methodology.
 - ✓ Net Density data might not reflect the city status as it includes undeveloped and under developed areas.
 - ✓ Only provisional quantity can be available for waste water.
 - ✓ Measure of extent of signal synchronisation varies with use of different technology.
 - ✓ Coverage of sewerage network suffers from lack of availability of appropriate property records.
 - ✓ Air pollution sample locations are often taken from near industrial areas.

9. EVALUATION OF IMPACT - CITY SERVICE SECTOR STATUS

Jabalpur is Business & Industrial Centre, Tier 2 city, known for its educational institutions and defense-related manufacturing industries. It has a national airport and is located on the North-South NH-7. The city is densely populated in patches and is spreading around city limits at a slow pace. [15]

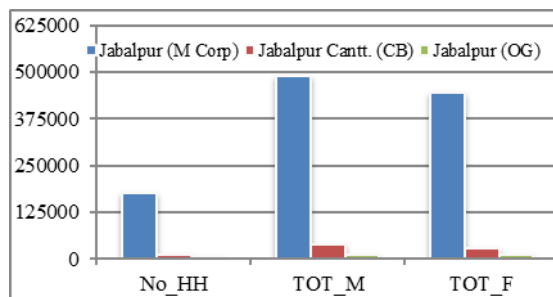


Figure 4: Negligible urban population outgrowth of Jabalpur (as per Census 2011)

For the review of city services, we have to analyse the status of infrastructure and services. The agencies providing these are -

- Jabalpur Municipal Corporation is headed by Mayor. The administrative wing is headed by Municipal Commissioner. Its presently divided into 79 wards. [15]
- Jabalpur Development Authority (JDA) vested with the task of developing housing and other civic amenity infrastructures, works under the administration of Housing and Development Ministry of Madhya Pradesh Government. [15]
- Smart City Cell was created as SPV Company after selection of Jabalpur in first phase of Smart City Mission. Main functions of Jabalpur Smart City Limited (JSCL) are: [15]
 - Provide basic infrastructure to the citizens,
 - Develop infrastructure facilities to improve quality of life for its citizens,
 - Contribute to creating a clean and sustainable environment and
 - Apply Smart Solutions to address infrastructure constraints in the city.

While the city administration is responsible for a planned development, development direction is hooked upon the fund sources and priorities of funding schemes. In a comparison of the expenditures planned under various Smart Cities of the Madhya Pradesh state, Bhubneshwar as a benchmark gives following insight.

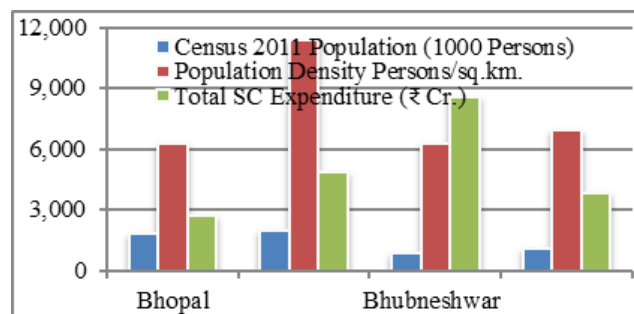


Figure 5: Smart City investments are lower in Smart Cities of Madhya Pradesh state in context of population density.

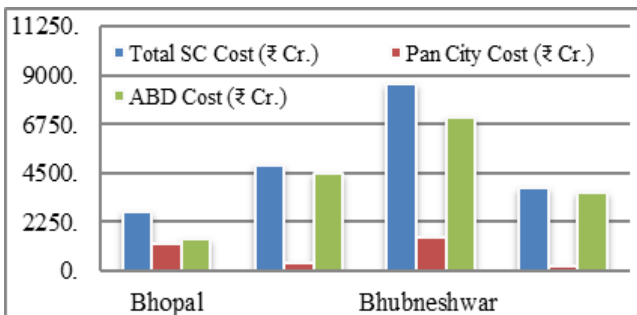


Figure 6: Pan City investments are almost negligible in case of Jabalpur and stands at 64th rank nationally (while it is 7th in Area Based Development projects in terms of proposed cost investments.)

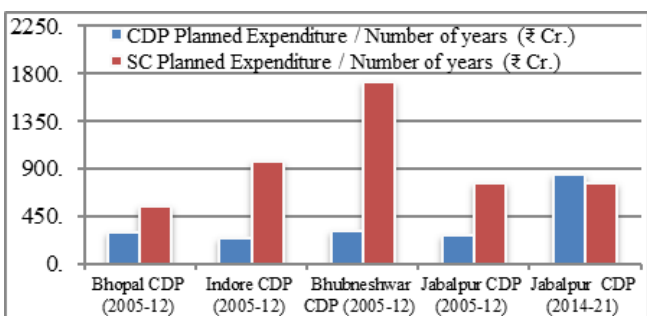


Figure 7: CDP Projected Investments vs. Smart City Expenditure Plan Smart City investments are lower in Smart Cities of the Madhya Pradesh state in proportion to overall expenditure expected under respective CDP reports.

In the year 2014, revised City Development Plan for Jabalpur proposed an overall investment estimated at Rs. 5420 crores (on constant prices), it was understood that as per the availability of grants, JMC can take up priority projects only, namely sewerage and sanitation, traffic and transportation etc. In the summary of Capital Investment, based on the financial modelling, the options of funding for projects were recommended as follows: -

- JMC can make a sustainable investment of Rs. 2809 crores, (only 42% of the total short-term investment).
- Option of exploring funds from market borrowings.
- Implementation of projects on PPP basis.

The total estimated capital investment required for providing efficient services to the present population and future population of the city by the year 2041 is Rs. 8621 crores.

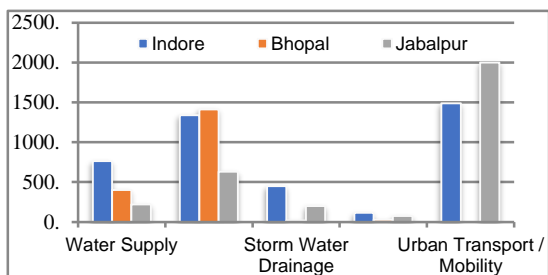


Figure No.8: Abstract of Funds (Amount Rs. in Crore) required to achieve Service Levels as prescribed under AMRUT Source: Page 17 of State Annual Action Plan for FY 2015-16 & Perspective Plan 2015-20 (SAAP) of Madhya

Pradesh, published by Urban Development and Environment Department, GoMP [16]

So, the best and the worst sectors in city services are Water Supply and Transportation respectively.

9.1. The status of Water Supply Sector

The city is divided into eight administrative zones for the management of water supply. Jabalpur gets 130 million liters per day (MLD) of water from Narmada; and 25 MLD from the Garr and the Khandari reservoir collectively. The city draws about 269 MLD of water from surface water sources and tube wells. Water supply is adequate in most of the areas, except the high lying areas where the water supply pressure is less. Currently, Jabalpur has about 300 MLD of installed water treatment capacity (240 MLD production) and the treated water is distributed to 1.4 lakh customer connections. [17]

Table 10. Indicator in Water Supply Sector in Ease of Living Index: Assured Water Supply

Household level coverage of direct supply connections	Core
Per capita supply of water	Supporting
Quality of water supplied	
Level of non-revenue water - NRW	
Coverage of storm water drains	
Percentage of water connections through smart meters	
Percentage of plots with rainwater harvesting facility	

Table 11. Values of Indicators in Water Supply

Indicator	Value	Unit	Particular	Value
12.1 Household level coverage of direct water supply connections	68.27	%	Total number of households with direct water supply connection	144020
			Total number of households in the city	241329
12.2 Per capita supply of water	191.44	LPC D	Total quantity of water supplied into the distribution system	23100000
			Total population of the city	1206644
12.3 Quality of water supplied	100	%	Number of samples meeting or exceeding specified potable water standards	1400
			Total number of samples tested for water quality	1400
12.4 Level of non-revenue water – NRW	30	%	Quantum of water put into distribution system (MLD) - Quantum of water sold (MLD)	-
			Quantum of water put into the distribution system (MLD)	-
12.5 Percentage of water connections covered through meters	6.24	%	Number of metered water connections	9000
			Total number of water connections in the city	144020
12.6 Percentage of plots with rainwater	22.48	%	Number of new developments/redevelopments (of designated plot size),	395

harvesting facility			commercial and public buildings with RWH facility	1757
			Total number of new developments/redevelopments (of designated plot size), commercial and public buildings in the city	

9.2. The status of Transportation Sector

Population density is very high in the core area of the city. The planning is very informal and organic where an improved physical planning can be done. There is very little work done in transportation sector. There is apparent gap in physical infrastructure, especially basic amenities like parking provisions. As per Jabalpur Transport Sector CMP (Under JNNURM Municipal Corporation) issues in Urban Transport are as follows.

- The city road network system lacks functional hierarchy.
- The public transport system is highly unorganised.
- There are limited organised on and off-street parking facilities in the city.
- Poor intersection geometries and control.
- Present road capacity is unable to handle numbers of vehicles.
- Absence of development controls like Non-residential activity on residential premises and highly politicised squatter settlements.
- Lack of Planning, infrastructure development and Information and Communication Technology Infrastructure (ICT).

ICT might help sort out the planning issues and reduce the need to travel and lead to changes in travel patterns.

Table 12: Transportation and Mobility Indicators in Ease of Living Index [12]

Core	Supporting
Geographical coverage of public transport	Per capita availability of public transport
Mode share of public transport	Percentage of interchanges with bicycle parking facilities
Percentage of road network with dedicated bicycle tracks	Availability of Passenger Information System
Mode share of non-motorised transport	Extent of signal synchronisation
Availability of paid parking spaces	Availability of Traffic Surveillance System
Percentage coverage of footpaths – wider than 1.2m	Percentage of traffic intersections with pedestrian crossing facilities
	Extent to which universal accessibility is incorporated in public rights-of-way

Table 13: Values of Transportation and Mobility Indicators

Indicator	Value	Unit	Particular	Value
11.1 Geographical coverage of public transport	0.83	Road kms per sq. km	Total length of public transport network (road km)	220
			Total area of the city (sq.km)	263.49
11.2 Availability of public transport	0.07	Number per 1000 perso	Average number of public transport vehicles available per day	90
			Total population of the city	1206644

		ns		
11.3 Mode share of public transport	7	%	Total public transport trips	540
			Total trips through all modes in the city	-
11.4 Percentage of road network with dedicated bicycle tracks	0	%	Total length of bicycle network	0
			Total length of road network in the city	1050
11.5 Percentage of interchanges with bicycle parking facilities	25	%	Total number of major transport interchanges with bicycle parking facility (within 250m radius)	1
			Total number of major transport interchanges in the city	4
11.6 Mode share of non-motorised transport	65	%	Total NMT (pedestrian, cycling and cycle rickshaws) trips	-
			Total trips through all modes in the city	-
11.7 Availability of Passenger Information System	25	%	Total number of major interchanges with PIS	1
			Total number of major interchanges in the city	4
11.8 Extent of signal synchronisation	45.45	%	Total number of signalised intersections that are synchronised	5
			Total number of signalised intersections in the city	11
11.9 Availability of paid parking spaces	30	%	Total available on-street paid parking spaces in the city	-
			Total available on-street parking spaces in the city	76 % of Road stretch
11.10 Percentage coverage of footpaths – wider than 1.2m	1.4	%	Total length of footpaths (wider than 1.2 m) available in the city	-
			Total length of road network in the city	1050
11.11 Percentage of traffic intersections with pedestrian crossing facilities	0	%	Total number of intersections with pedestrian crossing facilities on major roads	11 (Signal s on Junction n)
			Total number of junctions/ intersections on major roads in the city	-
11.12 Extent to which universal accessibility is incorporated in public rights-of way	0	%	Number of public right-of-way areas designed as per universal design principles	NONE
			Total number of public right-of-way areas in the city	-

Sources: JDA, JCTSL-JMC, JSCL 2017, Census 2011, CDP 2041-JMC, Vidhyut Vibhag, -JMC, CMP-JCTSL-JMC [18]

9.3. Actual Work Done in Weakest Sector

A lot of on ground work is being done to bridge gap in city infrastructure. Realistic projects related to improvement of local conditions give an edge to Jabalpur over other cities. One of the major issues is the lack of traffic and civic sense amongst citizens.

9.3.1. Proposed ABD Projects

- Multi-Level Parking Cum Commercial Complex at George Town
- Bhawartal Swimming Pool and Mulilevel Parking
- Multi-Level Parking at Nav Bharat, Manas Bhavan, Civic Center
- Parking (20) at 14 Locations
- Jabalpur Smart road Phase – 1 (Major Roads Class-A & Class-B) 14.7 Km including 1) UtilityDuct (u/g electric cable & OFC) Smart Road 2) Water Supply 3) With NMT
- Jabalpur Smart Road Phase – 2 of Class-C Roads
- NMT (Non-Motorized Transport) Phase – 1 Madan Mahal to Ghanta Ghar (Omtinala) 2.4 Km Phase – 2 Remaining Omtinala 4.6 KM [19]

9.3.2. Proposed Pan City Projects

- Damoh Naka Bus Depot
- Green BRTS and Bus Terminus at Gwarighat
- Modern City Bus Services
- NMT from Gorakhpur to Gwarighat (6 km)
- Public Bicycle Sharing
- Road Safety Audit & Identification of Black Spots
- Transport Nagar (80 acre) [19]

9.4. Review of ground realities: Status and resolution of issues in proposed projects

City level drain, Omti nallah was identified that it can be covered and then can be redeveloped as a cycle and pedestrian track interconnecting various parts of the city. Jabalpur having a plain terrain is suitable for bicycle ride. The 'Non-Motorized Transit' (NMT) initiative aims to add value to ABD part of the Jabalpur Smart City. The primary objective is to increase the recognition of NMT as one of the key transport modes. It will also improve regulation and enforcement to enhance greenery. According to Mr. Sanjay Srivastava, ex-Team Leader, Smart City Jabalpur, the Omti nallah design concept was conceived so as to give integrated public spaces at walkable distances on unused or misused spaces.

10. RESULT AND DISCUSSION

There is little clarity on 'on ground' situation from the index calculators especially from perspective of strength and weakness of city. While it was a known fact that Jabalpur was an under developed area, it was realised that it has huge potential for growth if organised development gains momentum in the city.

11. CONCLUSION

This paper intended to conclude on governance aspect of the Smart City Mission and its assessment from Ease of Living index. Index makes basics of municipal governance clear for the city administration at all levels and hence gives opportunity to be willingly formally organized work force on priorities with clarity on severity of various challenges of urban management listed as indicators. While the other aspect of extent of use of technology is yet to be realised, there is obvious understanding on lack of smart manpower. There is need for capacity development and with 'Ease of Living Index' Smart City Cell. Ease of Living index comparison will create competitive evolution of Municipal Corporation without context of individual

resources and challenges. It is observed in the study that more than planning proposals, smart city management is about resolution of issues, with a development vision. And in case of Jabalpur there is a conscious development of projects towards making of a better city. From first step of better pillar of governance we need to establish the development of cities as a constant process from one stage to another through stakeholder ownership in urban management as 'Smart' Development.

REFERENCES

- [1.] Manager -IOT / Smart Communities, Product & New Business Innovation, Getting Smarter About Smart Cities, Adie Tomer and Robert Puentes
- [2.] international-trade-opportunities: YABA
- [3.] Practical tools for getting started with the SDGs UN SDSN
- [4.] Finance commission stipulates procedure for urban local body
- [5.] Reconceptualising Smart Cities: A Reference Framework for India BY: Shrimoyee Bhattacharya, Sujaya Rathi, Sonali Anusree, Patro, Niepukhrie Tapa
- [6.] The Centre's 'City Liveability Index' Is Set to Become A Major Tracker of Urban Indian Life: Quality control in progress. By Nilanjan Mukhopadhyay
- [7.] The Global Liveability Index 2018 A free overview: A report by The Economist Intelligence Unit
- [8.] Exploring Liveability as a dimension of Smart City Mission (India) Authors -Aman Randhawa and Dr. Ashwani Kumar, International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 04 Issue: 11 | Nov -2017
- [9.] Third International Conference on Financing for Development
- [10.] Smart Cities Mission: A step towards Smart India
- [11.] What exactly is a smart city? The Indian government does not want you to know Kumar Sambhav Shrivastava
- [12.] Methodology for Collection and Computation of Liveability Standards in Cities, Ministry of Housing and Urban Affairs, Government of India
- [13.] Liveability Standards in Cities
- [14.] E Nagar Palika App, JMC website, Jabalpur 311 app, Swachhta app
- [15.] India Smart City, Profile 1 City: Jabalpur, State: Madhya Pradesh
- [16.] Page 17 of State Annual Action Plan for FY 2015-16 & Perspective Plan 2015-20 (SAAP) of Madhya Pradesh, published by Urban Development and Environment Department, GoMP
- [17.] Water and Sanitation Services in Jabalpur, baseline survey for SLB connect synthesis report BY: Priya educationalist trust, New Delhi
- [18.] JDA, JCTSL-JMC, JSCL 2017, Census 2011, CDP 2041-JMC, Vidhyut Vibhag, -JMC, CMP-JCTSL-JMC
- [19.] Smart Traffic - Jabalpur Smart City
- [20.] V. Sushant, Ted Talk - Smart Cities need Smarter Design Education
- [21.] A Tomer, R. Puentes, Brookings/ESADE, et al., Getting Smarter About Smart Cities, Key themes and takeaways from the workshop
- [22.] G.MoUD, Official website of the Ministry of Urban

- Development (MoUD), Government of India. Home Publication / Policies and Guidelines / Policies and Guidelines / Service Level Benchmar
- [23.] Smart Cities: A Survey on Data Management, Security and Enabling Technologies Ammar Gharaibeh, Member, IEEE, Mohammad A. Salahuddin, Member, IEEE, Sayed J. Hussini, Student Member, IEEE, Abdallah Khreishah, Member, IEEE, Issa Khalil, Member, IEEE, Mohsen Guizani, Fellow, IEEE, and Ala Al-Fuqaha, Senior Member, IEEE
- [24.] SMART CITY MISSION, Ministry of Housing and Urban Affairs, Government of India
- [25.] 3rdThird Buch Memorial Lecture by Mark Tully