URBAN AREA REGENERATION: REDEFINING VARIABLES FOR INDORE CITY BY USING MCDM METHOD

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ABSTRACT : Indian cities in today's era of digital transformation are changing rapidly under the label of a smart city project, impacting small and large town planning and strategies. These cities must tackle localized or situated issues like urban area regeneration, urban poverty, education, health, migration and job creation. Whereas these cities must prepare them for larger issue of climate change and resource scarcity. These multidimensional challenges need newer ways and approaches for systematic solutions and enhance broaden the role of researcher, planners, and regulators of cities. The cities under smart city project have different localized or situated issues and finding the right approaches is a challenge for scientist and urban practitioners. Finding the right balance for urban sustainability transitions need regress analysis of socio-technological variables. The variables are important to consider because it is targeting the entire societal system which has its flavor of culture and organics historically. This article is attempted to highlight the variables which are important for Indore city redevelopment under smart city mission by using modified TOPSIS. The novelty of this work is evaluation of alternatives in an uncertain environment, where each alternative has all together criteria which have some or no connection between them.

KEYWORDS: Smart City Mission, Sustainability, Urban Area Regeneration, Urban Sprawl, Slum Dwellers, Inclusive Planning, Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), Multi Criteria Decision Making (MCDM)

I. INTRODUCTION

After initial appearance of term, the smart city many scholars have touched the subject (Bastelaer, 1998; Caragliouet al., 2011;Chourabi etal., 2012; Cosgrave et al., 2013 and Debnath et al.,2014). In the context of smart city, an emerging phenomenon with every passing month, the proposed research exploring the variables which needs to be consider for sustainable urban area regeneration. The Indian cities are undergoing large scale transformation under Smart City Project, which is an additional challenge for city planner, scientist and urban practitioners. This is an urban regeneration program launched in June 25, 2015 as "Smart City Mission" by Indian Government elected in May 2014. The main of this project is to provide better quality of life to the citizens living in these selected cities. The investment of 2,039 billion rupees is being planned for the project (Press Information Bureau,27 August, 3 September and 6 October 2015; MoUD, 2015 and Smart City India). The stages and selection of cities for Smart City Mission are shown below (figure 1);

The cost of smart city project of Indore City is divided into three main components namely PAN City Area (Population- 25 Lacs, Area- 276 SQ.KM, Cost – RS. 700 CR. For ICT Solutions) Retrofitting Area- Based Development (ABD) (Population – 1.25 Lacs, Area – 742 Acres, Cost – RS. 1400 CR), Redevelopments on PPP-mode (Area-54 Acres, Cost-2900 CR PPP). The total cost of project is around 5099 CR. Rupees (Smart city Indore)

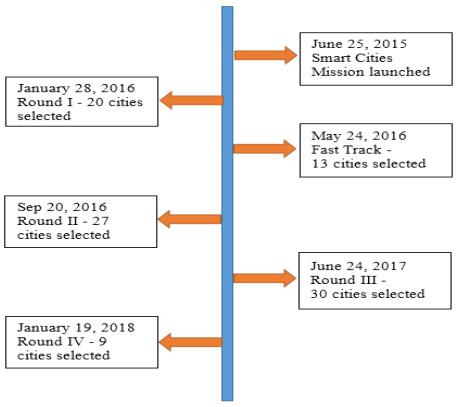

Fig.1 Stages and selection of cities for Smart City Mission (Author Created, Source: http://smartcities.gov.in/content/)

The transformation and upgrading of area or space of importance for smart city development for Indian context needs right balance between political alignment, planning, stakeholder management and financing. The urban infrastructure is mix of technical elements like sewer system, solid waste management system, wastewater treatment plants, supply network, parking lots, roads and power plants and non-technical elements like organizations, institutions and actors. For addressing the critical issues which any city will encounters in future needs multi-level perspective. The context of the space and physical configuration of the city is also important for the socio-economic fabric. The volumetric cultural space which include street shops, vendors and sitting area along the road developed in old Indian city over passage time, is also a challenge for city planner to maintain the balance between economy, culture and spatial patterns.

The integration of diverse perspective and its dynamics is urgent need for rerouting the path of sustainable development and transition. The methodology used in this work will aid decision making. The work based on two parts, one the design frame for planning parameters and other alternative selectionby using TOPSIS (with slight modification) as per our smart city planning problem. In traditional sense, MCDM methods are used to evaluate the performance of alternatives based on same but conflicting criterions. It becomes very complex or cumbersome when each alternative has altogether different criteria which have some or no connection between them. In work TOPSIS has been slightly modified to tackle this described above. The novelty of this work is to purpose a methodology for maintaining the equilibrium for urban area regeneration, where each alternative namely Indore urban sprawl, Indore's slum dwellers, saturated parking spaces and Indore water scarcity(all the issues) and each criteria or say solution are to be addressed in smart city mission.

II. BACKGROUND OF STUDY AREA

Indore city is a commercial capital of Madhya Pradesh and 12.1 percent of total urban population of the state lives in Indore (highest urban population of the state as per Celsius of 2011). Indore in the western part of Madhya Pradesh is a hub for all major business activities of the state. It is situated almost centrally on the fertile Malwa plateau with an altitude of 553 m above sea level and with its cardinal points as 220 43' N latitude and 76042'E longitude. City is linked by three modes of transportation viz. Rail, Road and Air. The Mumbai - Agra Road (National Highway) passes through the city's habited area. The state highways and other roads connect the city with all district headquarters of the division, important towns and the state capital Bhopal. Indore city one of the few places in India served by both meter gauge and broad-gauge railway line. The city is also served by a regular air service which connects it to major city like Bhopal, Delhi, Hyderabad, Ahmedabad, Pune, Nagpur, Bangalore, Jaipur and Kolkata (Smart city Indore). It is currently the most populated city of Madhya Pradesh (as per Celsius of 2011). Indore is one of Madhya Pradesh's real test beds for smart city project under sustainable development India. It's a fantastic opportunity for urban experts, city planners and Engineers to take part in this attempt and deploy urban sustainable solutions in order to make Indore a smart megacity.

Indore city like other cities of India faced similar problems like unemployment, overcrowding, urban sprawl, housing, trash disposal, slums, informal economy, water shortage, illiteracy, lack public transport, Problem of Urban Pollution, Sewerage Problems, urban crimes and squatter settlements. The Smart Cities mission attempts to address these challenges, generating positive societal developmental outcomes. The continuous reinterpretations of urban planning of the city is necessary for steering urban regeneration in right direction. This article is attempted to highlight the variables which are important for Indore city redevelopment under smart city mission.

III. LITERATURE REVIEW

3.1 Smart City Framework

The design framework for smart city are different for different authors, researchers and designers. The factor important for developing smart city highlighted in literature is shown below

Table 1 Important Dimension/Factor/Variables of smart City

Author, Year	Important Dimension/Factor/Variables
Joshi et al. ,2016	Management, Social, Legal, Technology, Economic and Sustainability
Kramers et al. (2014)	large-scale participatory, rich environment of broadband networks
Sanchez,2014	Internet Service and IoT
Neirotti,2014	ICT and Policy
Kitchen,2013	Big Data Technology
Lee et al. 2013	governance, living, environment, mobility, economy and people

Chourabi et al. 2012	management and organization, the natural environment, governance, people and communities, policy, the economy, built infrastructure, and technology
Nam and Pardo, 2011	Technology (software and hardware infrastructures), Institutions (governance and policy) and Population (creativity, diversity and education)
Leonidas et al. 2011	Coherent regional growth support (History & Landscape), Environmental protection (Quality), Resources capitalization (Capacity) and Sustainable residential development (Viability Timeline)
Harrison et al., 2010	energy consumption statistics, traffic management, security, and optimizing the operation of municipal services

The literature review on smart city and its frame suggested importance of multiple variables and multi-dimension approach for urban area regeneration. Some cities around different part of world have addressed them based on their needs like Amsterdam used innovate technology to tackle climate challenges (Lee et al., 2014), Brisbane used smart integrated technologies for sustainable space and urban design (Pancholi et al., 2015) and Doha used interaction of knowledge economy activities and urban technologies (Conventz et al.,2015). Similar Every Indian city must address them based on their needs.

3.2 Sprawling City of Indore

After independence, thousands of hectares of rural and forest fertile land taken for urban infrastructure development. In Madhya Pradesh the number of towns has increased from 181 in 1961 to 476 in 2011(as per Celsius of 2011). These trends of occupying space witnessed unplanned, uneven and uncontrolled growth of urban infrastructure which might not the sustainable. The problem land encroachment will become a major issue if not addressed with greater importance. The trends of urbanization of Madhya Pradesh is shown in the figure: -

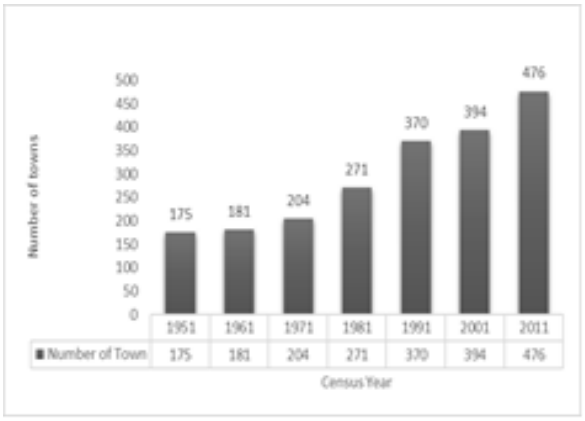

Fig.2 Decennial town status in Madhya Pradesh: 1951 to 2011(Source: Census India)

These upward trends of urbanization show that town in the states increased rapidly and which has added pressure on state government, urban local bodies and planners for economic development, employment, health services, housing, and education. Under smart city project seven cities namely Indore, Bhopal, Jabalpur, Gwalior, Satna, Sagar and Ujjain are from Madhya Pradesh (Smart City India). The four most populated cities of Madhya Pradesh are Indore, Bhopal Jabalpur and Gwalior having million plus population (Census of India, 2011). The Indore city being the commercial capital of Madhya Pradesh and 12.1 percent of total urban population of the state lives in Indore (Census of India, 2011) has extra pressure of performance under smart city mission. The Smart city project planning of Indore should have included urban sprawl because population growth of the city is always related with demand for land and inclusion of villages within the municipal corporation limits for non-agricultural uses. This situation of inclusion of villages into city limits can be an issue for future generation because land is finite resource and fertile land should preserve for agriculture purposes. Smart city project planning of city should have included

these issues of land acquisition or inclusion of villages.

3.3 Indore's Water Scarcity

Indore city is naturally water scarce, as it is situated on dry Malwa Plateau of Madhya Pradesh. The water requirement of the city is taken care by Indore Municipal Corporation. The city water supply demand is meet by various source like local reservoirs, Narmada River, private water suppliers and ground water. The data shown below highlights the installed capacity and water drawn output from the surface water sources (Project Armut,2017 and Indore City Resilience2012).

Surface Water	Installed capacity in MLD	Drawn Output in MLD
Narmada River	540	360
Yashwant Sagar Dam	45	34
Bilawali Tank	9	3

The data above shows that Narmada river water is most important source. The Narmada water is pumped from 70 Kms away from the city (Project Armut,2017 and Indore City Resilience 2012). The smart city mission laid the foundation for more IT sector and more advanced technological industries which in turn demands more groups of people to come to city for work. These migration of peoples from other cities demands more colonies, urban infrastructure and water for their needs. The ever-rising demands for water need urgent attention and planned carefully for future generation.

3.4 Saturated parking spaces of Indore

The Indore's accessibility and poor parking facilities are repeatedly questioned after every urban project implementation. This troublesome, unregulated and chaotic parking situation affects functioning of school, colleges, hospitals, banks, ATM and other specialized institutions of the city. The parking are typically done illegally on footpaths, service roads and open frontage which may decrease accessibility of roads for other vehicles (The Free Press Journal, 2015, 2016 and 2017) .The smart city project and recent popularity gained by city in cleanliness will attract more flux of people to the city and enhance numerically rise of vehicles. The urban sprawl and industrial growth of the city has increased the consumption of private vehicles. The incidents of quarrels and arguments are common due to parking and traffic congestion in Indore (The Free Press Journal,2018). The potential parking spaces for residential are vacant plots, footpaths, and garden spaces. The widening of roads, multilevel and ground parking are failed to tackle magnitude of situation, but still these solutions are implemented by planners of city administration. The smart city project targeted this problem in the same way as it is addressed in past planning projects. The immediate solution to this parking problems of city is not by providing more parking spaces. The city planning needs more dynamic measures for long term planning.

3.5 Indore's slum dwellers

As per report "Slum Free City Plan for Indore Metropolitan Area", May 2013, 38% of population of Indore are in Squatters and Slums (Slum free plan, IMC report, 2013). The total number of slums was 26 in year 1951 and in 1991 it was increased to 183(Slum free plan, IMC report, 2013). Many plans and schemes like Valmiki Ambedkar Awas Yojana (VAMBAY), Jawaharlal Nehru National Urban Renewal Mission (JNNURM), Rajiv Awas Yojana (RAY) and similar other to address this issue of slum in Indian cities. The slum and Squatters also contribute to economy of city. Any redevelopment from scratch especially certain area of importance for slum dwellers raised the concern of their livelihoods.

IV. METHODOLOGY

The part of work is building a framework that may suit to city issues highlighted above in literature review. The framework model of sustainable urban area regeneration for the city is proposed by using literature review of the articles, news storyline, research papers and planning document discussing issues, history and planning of Indore city. The studies on smart city initiatives, framework and models are reviewed to build an integrative framework model that indicates and explains that inclusion of some variables in planning may be more influential and sustainable for the smart city project than the present variables. The study for the development of framework model selected urban key trends which will deliver sustainable outcomes to tackle issues and problem faced by Indore since many years. For constituting the multidimensional, multidisciplinary and integrated vision of understanding, significant amount of research paper was searched, selected and analyzed. The studies having

single disciplinary or specific dimensional approach were rejected for addressing the sustainable urban area regeneration of the city.

The second part of the based decision-making part based on planners and experts' ratings for the alternatives suggest in framework with their criteria by using TOPSIS with slight modification. For ranking, assessing and evaluating alternatives across various disciples, MCDM methods are used by practitioners, researchers and scholars. One such popular methods is TOPSIS proposed by Hwang and Yoon in 1981, used for choosing best alternative with certain number of criteria. The methodology used for the study is highlighted in figure below: -

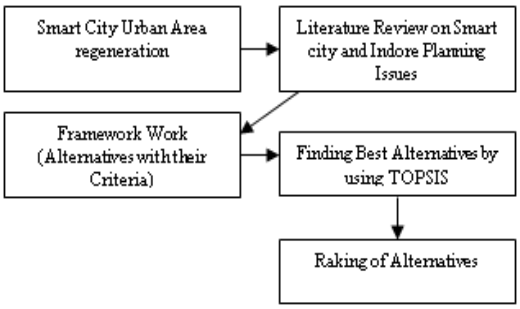

Fig.4 Methodology

For any decision-making problem, let there are s criteria and r selectable alternatives, then,decision matrix is defined as $T_r = [g_{ij}]_{r\times s}$, where i= 1,……,r and j= 1,….,s.

The procedure of TOPSIS used (Opricovic andTzeng, 2002) is as follows:

Calculate the normalized decision matrix

$T_{rnormalized} = [n_{ij}]_{r\times s}$;

Where$n_{ij} = g_{ij}/\sqrt{\sum_{i=1}^{r} g_{ij}{}^2}$(1)

and weighted normalized decision matrix. The weighted normalized value $b_{ij} = a_j * m_{ij}$;wherea_j the weight of the criteria.

Determine the ideal solution and negative ideal solution (NIS)

$b_i^* = \left(\max_i(b_{ij})\middle| j \in L\right), \left(\min_i(b_{ij})\middle| j \in K\right)$(2)

$b_i^- = \left(\min_i(b_{ij})\middle| j \in K\right), \left(\max_i(b_{ij})\middle| j \in L\right)$, (3)

Where K is associated with the cost criterion and L is associated with the benefit criterion.

Calculationof the separation measure for each alternativefrom ideal solution and NIS using n-dimensional Euclidean distance as follows.

$Z_i^* = \sqrt{\sum_{j=1}^{s}(b_{ij} - b_i^*)^2}$ i = 1, … … .,r (4)

$Z_i^- = \sqrt{\sum_{j=1}^{r}(a_{ij} - a_i^-)^2}$ i = 1, … … . , s(5)

Calculate the relative closeness of alternative H_i to ideal solution, which is given by

$F_i^* = {Z_i^-}/{(Z_i^- + Z_i^*)}$ (6)

According to value of F_i^*, rank the alternative. The best alternative that has the maximum value of F_i^* among other. That alternative would have the minimum distance from the ideal solution and the maximum distance from the NIS.

In context, where each alternative has criteria with some or no similarity. Calculation of ideal solution and NIS, as given below, for each alternative.

$u^*{}_i = Max(v_{ik})$(7)

$u^-{}_i = Min(v_{ik})$(8)

Equation shown below shows the calculation of the separation measure of each alternative from NIS and idealsolution using n-dimension Euclidean distance for each decision maker.

$Q_{ik}^- = \left(u_{ij} - u_i^-\right)^2$(9)

$Q_{ik}^* = \left(u_{ij} - u_i^*\right)^2$ (10)

Combined measure of each criteria from NIS and ideal solution can be done by following equation:

$Q_k^- = \sqrt{\sum_{i=1}^{i=m} Q_{ik}^-}$(11)

$Q_k^* = \sqrt{\sum_{i=1}^{i=m} Q_{ik}^*}$ (12)

Relative Closeness can be calculated based on following equation

$F_i^* = {Q_i^-}/{(Q_i^- + Q_i^*)}$ (13)

The maximum values F_i^* is the best alternative amongst others.

Urban Regeneration planning Framework and Discussion

The successful sustainable urban renewal must address the challenges faced by city and mitigate these deficiencies. These deficiencies need long term viable setting of variables of planning. The only focus on built environment is not enough for city, a balanced approach to transformation is required. The framework to achieve sustainable urban area transformation or regeneration has four dimensions. These dimension covers the problems and issues of the city and addressed them in an integrated way by covering the social, economic and environmental sustainability. This framework highlights the inclusion of variables for socially equitable, sustainable resource use, livable, inclusive and resilient development (Figure 2).

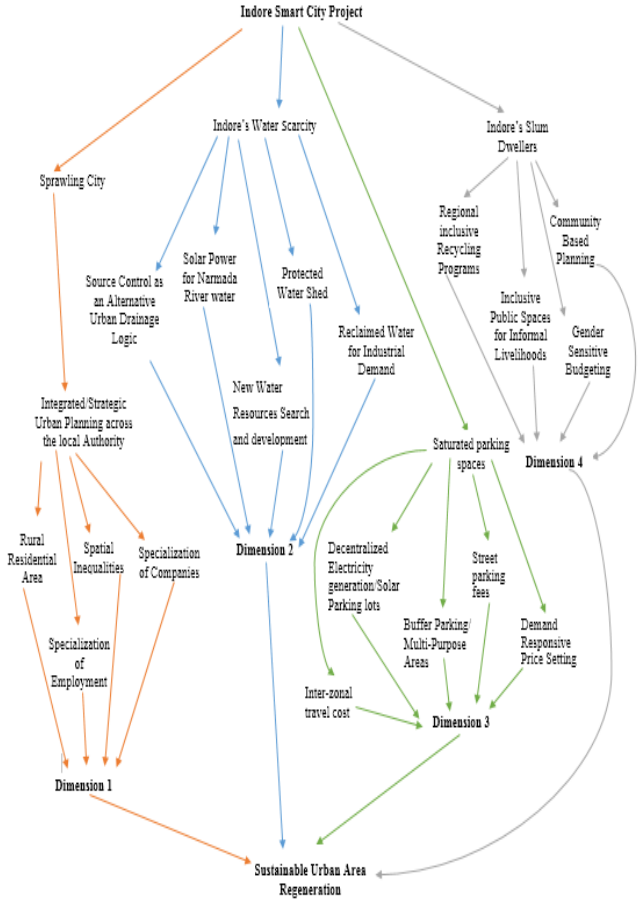

Fig. 2 Urban Area Regeneration framework for Indore's Smart City Mission (Source: Author Created)

The Table 3 below highlight the multi-dimension urban sustainability matrix for the variable chosen for the framework:

Table 3 Multidimensional Urban Sustainability (Source: Author created)

Multidimensional Urban Sustainability			
Parameters	Social	Economic	Environmental
Rural Residential Area(C_1)	√		
Specialization of Employment (C_2)		√	

Specialization of Companies(C_3)		√	√
Spatial Inequalities(C_4)	√		
Source Control as an Alternative Urban Drainage Logic(C_5)			√
Solar Power for Narmada River water(C_6)		√	√
New Water Resources Search and development(C_7)			√
Protected Water Shed (C_8)			√
Reclaimed Water for Industrial Demand (C_9)		√	√
Decentralized Electricity generation/ Solar Parking lots (C_{10})		√	√
Buffer Parking/ Multi-Purpose Areas(C_{11})	√	√	
Street parking fees(C_{12})		√	
Demand Responsive(C_{13})		√	
Price Setting(C_{14})		√	
Inter-zonal travel cost(C_{15})		√	√
Regional inclusive Recycling Programs(C_{16})	√	√	
Inclusive Public Spaces for Informal Livelihoods(C_{17})	√		
Community Based Planning(C_{18})	√		
Gender Sensitive Budgeting (C_{19})	√		

IV. MATHEMATICAL ANALYSIS

Application Example: For smart city planning based on city issues and problem four parameter are identified they all are to be addressed. To Find the right balance between these alternatives (DA_1-Sprawling city, DA_2-Indore's Water Scarcity, DA_3-Saturated Parking Spaces, DA_4-Indore's Slum Dwellers). The methodology described above is used. The criteria(C_1, C_2……C_{19}) are highlighted and shown in table and figure respectively. The committee of four decision makersof different research area are formed to rate the alternatives based on respective criteria. The objective of study is which alternative in our case issue/ problem need to be addressed in smart city project. All the issues are important, but how much ratio or mix of fund must be invested or utilized is actual case of multiple

decision criteria making problem. Based on literature review few of issue is selected, there might be n number of cases and criteria but for restricting our study these parameters are selected.

The Table 4 below shows the decision matrix based on evaluation by experts

Table 4 Decision Matrix

	Decision Maker 1 (DM_1)				**Decision Maker 2 (DM_2)**			
	DA_1	DA_2	DA_3	DA_4	DA_1	DA_2	DA_3	DA_4
C_1	0.22	0	0	0	0.3	0	0	0
C_2	0.33	0	0	0	0	0	0	0
C_3	0.2	0	0	0	0.25	0	0	0
C_4	0.1	0	0	0	0.22	0	0	0
C_5	0	0.2	0	0	0	0.21	0	0
C_6	0	0.12	0	0	0	0	0	0
C_7	0	0.4	0	0	0	0.21	0	0
C_8	0	0.2	0	0	0	0.12	0	0
C_9	0	0	0	0	0	0.31	0	0
C_{10}	0	0	0.3	0	0	0	0.4	0
C_{11}	0	0	0.2	0	0	0	0.1	0
C_{12}	0	0	0.15	0	0	0	0	0
C_{13}	0	0	0.25	0	0	0	0.12	0
C_{14}	0	0	0	0	0	0	0.11	0
C_{15}	0	0	0	0	0	0	0.21	0
C_{16}	0	0	0	0.4	0	0	0	0
C_{17}	0	0	0	0	0	0	0	0.2
C_{18}	0	0	0	0.2	0	0	0	0.4
C_{19}	0	0	0	0.1	0	0	0	0.2
$\sum$	0.85	0.92	0.9	0.7	0.77	0.85	0.94	0.8
	Decision Maker 3 (DM_3)				**Decision Maker 4 (DM_4)**			
	DA_1	DA_2	DA_3	DA_4	DA_1	DA_2	DA_3	DA_4
C_1	0.4	0	0	0	0.16	0	0	0
C_2	0.12	0	0	0	0.25	0	0	0
C_3	0	0	0	0	0.23	0	0	0
C_4	0.24	0	0	0	0.3	0	0	0
C_5	0	0	0	0	0	0.12	0	0
C_6	0	0.22	0	0	0	0.13	0	0
C_7	0	0.23	0	0	0	0.4	0	0
C_8	0	0.3	0	0	0	0.11	0	0
C_9	0	0.1	0	0	0	0.12	0	0
C_{10}	0	0	0.2	0	0	0	0	0
C_{11}	0	0	0.3	0	0	0	0.23	0
C_{12}	0	0	0.21	0	0	0	0	0
C_{13}	0	0	0.1	0	0	0	0.3	0
C_{14}	0	0	0.1	0	0	0	0.14	0
C_{15}	0	0	0	0	0	0	0	0
C_{16}	0	0	0	0	0	0	0	0.11
C_{17}	0	0	0	0.37	0	0	0	0.2
C_{18}	0	0	0	0.37	0	0	0	0.4
C_{19}	0	0	0	0.14	0	0	0	0.2
$\sum$	0.76	0.85	0.91	0.88	0.94	0.88	0.67	0.91

Ideal solution and NIS for each alternative is calculated using 7 and 8, shown in Table 5

Table 5 Ideal solution and NIS for Each Decision Maker

Decision Makers	Ideal Solution(u_i^*)	NIS(u_i^-)
DM_1	0.92	0.7
DM_2	0.94	0.77
DM_3	0.91	0.76
DM_4	0.67	0.67

Measure of Separation for each alternative can be calculated using equation 9 and 10. The values obtained by calculation are shown:

Table 6 Measure of Separation for each alternative

	$\mathbf{Q_1^*}$	$\mathbf{Q_1^-}$		$\mathbf{Q_2^*}$	$\mathbf{Q_2^-}$
DA_1	0.0049	0.0225	DA_1	0.0289	0
DA_2	0	0.0484	DA_2	0.0081	0.0064
DA_3	0.0004	0.04	DA_3	0	0.0289
DA_4	0.0484	0	DA_4	0.0196	0.0009
	Q_3*	Q_3^-		Q_4^*	Q_4^-
DA_1	0.0225	0	DA_1	0	0.0729
DA_2	0.0036	0.0081	DA_2	0.0036	0.0441
DA_3	0	0.0225	DA_3	0.0729	0
DA_4	0.0009	0.0144	DA_4	0.0009	0.0576

For each alternative from ideal solution and NIS Combined separation measure can be calculated using equation 12 and 11 respectively;

Table 7 Combined separation measure for each alternative

	$\mathbf{Q^*}$	$\mathbf{Q^-}$
DA_1	0.237276	0.308869
DA_2	0.123693	0.327109
DA_3	0.27074	0.302324
DA_4	0.264197	0.27

The Relative closeness for each alternative can calculated using equation 13. The evaluated values are shown in table below:

Table 8 The Relative closeness for each alternative

	$\mathbf{F^*}$
DA_1	0.565544
DA_2	0.725615
DA_3	0.527558
DA_4	0.505432

The ranking of the alternatives or results based on final calculation shown table 8, are as follows:

$DA_2 \rangle DA_1 \rangle DA_3 \rangle DA_4$

The result shows higher amount fund must be capitalized for Indore's Water Scarcity issues. The ranking only shows the importance as per rating given by experts. All the alternative which is an issues or hindrance to development of study are needed to address but ratio of investment under smart city mission may vary. The ratio or mix can be utilized based on this analysis. This work is based on literature review and mathematical model analysis, so there is scope of research and improvement. The uniqueness of this methods is selection of alternatives which itself is separate domain for different planner and engineers. The synchronism of altogether different into one and selection of alternative based on criteria with no similarity by using MCDM method is novelty of proposed work, which separate this study from other studies.

VI. CONCLUSION

This paper presented issues and problem of Indore and recommend some of variables for inclusion in smart city mission which may more influential for sustainable development of the city based on literature review, which was then used for designing framework and this framework was used for mathematical analysis by using TOPSIS method. For making city more resilient and attractive for future generation needs to some challenges like water scarcity, Renewable energy infrastructure development, social inclusion, saturated parking, traffic management, migration, economic infrastructure development and climate change a boarder issue. The process of building smart city should target the citizen issues on every dimension whether management societal, ecological and economic, challenges. This urban regeneration or transformation under Smart City Mission is forming the backbone for the city to compete on global scale. This paper concluded with the recommendation of the variables which are best suited to city issues. This paper highlighted the urgent needs of detailed studies for answering the critical problems and issues of city and future planning and studies this will be steppingstone for sustainable future of city. This work presents the scenario which can be applied to real situation of city planning. The novelty of method is acuminating the judgements of different decision makers from different domain like energy planner, water resource planners, architect and researchers into one umbrella for public planning problem. The future scope of study is evaluation of increased parameters, though it will increase the complexity, but solution will be closer to real and localized solution to smart city planning issues. This study can be applied to any city or area with few or some parameter added or subtracted from the work. But any exclusion of parameter will increase the distance to hidden issues of city planning.

VII. REFERENCES

[1] Van Bastelaer, B. (1998). Digital cities and transferability of results. In the Proceedings of the 4th EDC Conference on Digital Cities.

[2] Caragliou, A., Del Bo, C., & Nijkamp, P. (2011). Smart cities in Europe. Journal of Urban Technology, 18(2), 65–82.

[3] Chourabi, H., Nam, T., Walker, S., Gil-Garcia, J. R., Mellouli, S., Nahon, K., Pardo, T. A., & Scholl, H. J. (2012). Understanding smart cities: An integrative framework. In Proceedings of the 45th Hawaii International Conference on System Sciences.

[4] Cosgrave, E., Arbuthnot, K., &Tryfonas, T. (2013). Living labs, innovation districts and information marketplaces: A systems approach for smart cities. In Paredis, C. J. J., Bishop, C., & Bodner, D. (Eds), Proceedings of conference on systems engineering research (CSER 13) (pp. 669–677).

[5] Debnath, A. K., Chin, H. C., Haque, M. M., & Yuen, B. (2014). A methodological framework for benchmarking smart transport cities. Cities, 36, 47–56.

[6] Smart City India, http://smartcities.gov.in/content/ accessed on 14th October 2019

[7] Ministry of Urban Development, Smart Cities Mission Statement and Guidelines. New Delhi: Government of India, 2015. accessed on 14th October 2019

[8] Press Information Bureau, 'List of 98 cities selected under Smart Cities Mission'. New Delhi: Ministry of Urban Development, 27 August 2015.

[9] Press Information Bureau, 'Future of India's growth story is in cities which can be made smart with new initiatives', says UD Minister. New Delhi: Ministry of Urban Development, 3 September 2015.

[10] Press Information Bureau, 'Mission cities pick up consultants for preparation of Smart City Plans'. New Delhi: Ministry of Urban Development, 6 October 2015.

[11] Smart City Indore, https://www.smartcityindore.org/ accessed on 27 August 2019.

[12] General, Registrar. "Census Commissioner, India." Census of India 2000 (2011). Accessed on December 2019

[13] Joshi, Sujata, Saksham Saxena, and Tanvi Godbole. "Developing smart cities: An integrated framework." Procedia Computer Science 93 (2016): 902-909.

[14] Kramers, Anna, et al. "Smart sustainable cities–Exploring ICT solutions for reduced energy use in cities." Environmental modelling & software 56 (2014): 52-62.

[15] Sanchez, Luis, et al. "SmartSantander: IoT experimentation over a smart city testbed." Computer Networks 61 (2014): 217-238.

[16] Neirotti, Paolo, et al. "Current trends in Smart City initiatives: Some stylised facts." Cities 38 (2014): 25-36.

[17] Kitchin, Rob. "The real-time city? Big data and smart urbanism." GeoJournal 79.1 (2014): 1-14.

[18] Lee, J. H., Phaal, R., & Lee, S. H. (2013). An integrated service-devicetechnology roadmap for smart city development. Technological Forecasting and Social Change, 80(2), 286–306.

[19] Nam, Taewoo, and Theresa A. Pardo. "Conceptualizing smart city with dimensions of technology, people, and institutions." Proceedings of the 12th annual international digital government research conference: digital government innovation in challenging times. ACM, 2011.
[20] Anthopoulos, Leonidas G., and Athena Vakali. "Urban planning and smart cities: Interrelations and reciprocities." The Future Internet Assembly. Springer, Berlin, Heidelberg, 2012.
[21] Harrison, Colin, et al. "Foundations for smarter cities." IBM Journal of research and development 54.4 (2010): 1-16.
[22] Lee, J. H., Hancock, M. G., & Hu, M-C. (2014). Towards an effective framework for building smart cities: Lessons from Seoul and San Francisco. Technological Forecasting & Social Change, 89, 80–99.
[23] Pancholi, Surabhi, Tan Yigitcanlar, and Mirko Guaralda. "Public space design of knowledge and innovation spaces: learnings from Kelvin Grove Urban Village,Brisbane." Journal of Open Innovation: Technology, Market, and Complexity 1.1 (2015): 13.
[24] Conventz, Sven, et al. "When the Oryx takes off: Doha a new rising knowledge hub in the Gulf-Region?." International Journal of Knowledge-Based Development 6.1 (2015): 65-82.
[25] Indore Municipal Corporation, Indore "Detailed Project Report on Indore Water Supply System", PROJECT AMRUT, February 2017
[26] Strategy, Indore City Resilience. "Indore city resilience strategy for changing climate scenarios." Indore: TARU Leading Edge (2012).
[27] The Free Press Journal," Indore: People, police partners in parking problem", 17 February, 2018. Accessed on 15 December 2019
[28] The Free Press Journal "Indore: Unsystematic parking poses problems for commuters at Chhappan Dukan", Saturday, 27, May, 2017. Accessed on 17 January, 2020.
[29] The Times of India, "7 hi-tech parking lots in Smart City" 21, October, 2016. Accessed on 17 January 2020.
[30] The Free Press Journal "PARKING PANGS", 16, February, 2015. Accessed on 17 January, 2020.
[31] The report on "Slum Free City Plan for Indore Metropolitan Area" under Rajiv AwasYojna, IMC. Accessed on 18 January 2020.
[32] Opricovic, S., & Tzeng, G. H. (2002). Multicriteria planning of post-earthquake sustainable reconstruction. Computer-Aided Civil and Infrastructure Engineering, 17(3), 211-220.
[33] Tiwari, A., & Mishra, N. (2017). Sustainable and smart city project: An overview of the application of multi criteria decision making techniques and approaches for Indian context. International Journal of Management and Applied Science, 3(7), 1-6.

"References/Citation" to be included in "Research Articles"

[1] D Pandey, V Agarwal, "E-commerce Transactions: An Empirical Study", International Journal of Advanced Research in Computer Science and Software Engineering, Vol 4, Issue 1, pp. 669-671, 2014
[2] ShwetaSankhwar, V Singh, D Pandey, "Requirement engineering paradigm", Global Journal of Multidisciplinary Studies, Vo; 3, Isue 3, pp.1-8, 2014
[3] T. J. Ansari, D. Pandey and M. Alenezi, STORE: Security Threat Oriented Requirements Engineering Methodology, JournalofKing Saud University – Computer and Information Scienceshttps://doi.org/10.1016/j.jksuci.2018.12.005
[4] S Sankhwar, D Pandey "Software project risk analysis and assessment: A survey", Global Journal of Multidisciplinary Studies Vol. 3, Issue 5, pp. 144-160, 2014
[5] D Pandey, U Suman, AK Ramani, "an approach to Information Requirement Engineering", 2011 International Conference on Information Science and Applications, Korea, pp. 1-4, 2011
[6] D Pandey, U Suman, AK Ramani, "Security Requirement Engineering Framework for Developing Secure Software", International Journal of Computational Intelligence and Information Security, IJCIIS, Australia, Vol. 1, Issue 8, pp. 55-65, 2010.
[7] V Singh, S Sankhwar, D Pandey "A framework for requirement elicitation", Global Journal of Multidisciplinary Studies, Vol 1, Issue 1, pp. 1-7, 2014
[8] D Pandey, V Pandey, ""Requirement Engineering: An Approach to Quality Software Development, Journal of Global Research in Computer Science Vol. 3, Issue 9, pp. 31-33, 2012
[9] S Sankhwar, D Pandey , "Defending Against Phishing: Case Studies", International Journal of Advanced Research in Computer Science Vol. 8, Issue 5, pp. 2605-2607, 2017

[10] S Sankhwar, D Pandey, RA Khan, "A Novel Anti-phishing Effectiveness Evaluator Model", International Conference on Information and Communication Technology for Intelligent Systems, pp. 610-618, 2017

[11] Mahra, A. K. (2019) Management Information Technology: Managing the Organisation in Digital Era . International Journal of Advanced Science and Technology 2005-4238 , 29 (6), 8803-8808.

[12] Mahra, A. K. (2019) Teaching Practices In Management Education: Patliputra Journal of Indology ISSN: 2320-351x , 3 (2), 40-50.

[13] Mahra, A. K. (2019) Application Of Knowledge Management In Management Education Anusandhan Vatika 2230-8938, 3 (3), 6-10.

[14] Mahra, A. K. (2019) A Strategic Approach to Information Technology Management International Journal of Advanced Science and Technology 2207-6360 , 28 (20), 1346-1351.

[15] Mahra, A. K. (2019) A Systematic Literature Review On Risk management For Information Technology International Journal of Advanced Science and Technology 2207-6360 , 28 (20), 1352-1358.

[16] Dwivedi, S. M., & Mahra, A. K. (2013). Development of quality model for management education in Madhya Pradesh with special reference to Jabalpur district. Asian Journal of Multidisciplinary Studies, 1 (4), 204-208.