

Analysing the Dystopic Aspects of a Utopic Vision in Pune

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Abstract: *They say that by 2050, the 70 percent of world population will be living in cities. The ‘IT Effect’ has rubbed off well in the real estate sector, and now plans to have a city-level impact. By and large, the smart-city concept, though an ‘indianized’ version of it, has become the ‘talk of the town’ for the entire country. In the globalized world, the ‘smart city’ concept is employed to employ drones, machines, computers, sensors & meters on a wireless broadband platform; as opposed to providing jobs to the influx of new urban population. It is still questionable whether this kind of shift is adaptable in India yet. Although the ‘smart city’ movement is addressing the urban context in general, it cannot be said that this is an architectural epoch, or a node in the time-line of history of Urban Design; it is rather, an epoch in the urban fabric, or a mass information technology movement; it cannot be enveloped under the term ‘urban design’ as it is an urban-level application of information technology. A consumer-specific concept, these new breed of cities aim at becoming centres of development, in competition with each other, capable of bank-ability and profit generation. The success of cities also relies on them becoming centres of consumption. In these cities, which are becoming centres of rising salaries and even higher rents, construction of real estate finds growth towards the fringes, bringing in gentrification and an increase in carbon-footprint. Pune, also known as the ‘culture capital of Maharashtra’, is home to more than 5 million number of people. The research aims to address the most basic questions like ‘why Pune’ and ‘why not’ for the smart city movement by analysing the proposal submitted by Pune Municipal Corporation (PMC) to the City Selection Committee & the Environmental Status Report prepared by PMC for decision-making in the urban context. In this regard, it tends to carry out an analysis for the population and pollution rise, temperature trends over the past few years, unemployment and gentrification, accessible technology, pedestrian and traffic infrastructure, and how it addresses climate change in the proposal.*

Keywords: Smart-city, Pune, Environment, Gentrification, Temperature, Urban-development, Urban Planning

Introduction:-

We had smart watches, smart phones and smart televisions; well, in a few years we will have ‘smart cities’. They say that by 2050, seventy percent of world population will be living in cities.¹ The

‘IT Effect’ has rubbed off well in the real estate sector, and now plans to have a city-level impact. To accommodate the growing influence of the growing cities, smart-city movement has gained momentum globally keeping the long-term sustainable goals in view. By and large, the smart-city concept, though an ‘indianized’ version of it, has become the ‘talk of the town’ for the entire country.

The cities that exist today require holistic and interdisciplinary approach to derive solutions to the challenges and threats faced. The progressive concept of smart city targets to provide qualitative living for the ever-rising population in the cities, economy generation for the influx of people, and addressing solutions to global issues of climate-change.

Smart Cities in the ‘Smarter Planet’

The United States defines the smart city concept as:

“Communities that are building an infrastructure to continuously improve the collection, aggregation, and use of data to improve the life of the residents- by harnessing the growing data revolution, low-cost sensors, and research collaborations, and doing so securely to protect safety and privacy.”²

Strange as it may seem, the definition doesn’t capture the environmental aspect and sustainability part of the concept. Since the historic Industrial Revolution, everything in the world is getting smarter at an increased rate. Processes have become technology-based and fast-paced; decreasing the load on manual work and offering ease of lifestyle; but simultaneously, increasing the load on the environment.

Initially, started as a corporate initiative by IBM in 2008, the ‘smarter planet’ campaign aimed at economic growth, sustainable growth and societal progress through smarter computing framework. The IBM ‘Smarter Planet’ campaign off-shoot IBM ‘Smarter Cities’ campaign, which not only addresses the pressing problems of cities, but also plans to make them ‘smarter’ through IBM cloud computing, analytics, mobility and social business to manage complex systems and processes like energy, transportation, security, healthcare, infrastructure, commerce, environment, telecommunication and resources. The widespread adaptation of this concept has yielded terms like ‘smart family’ and ‘smart citizen’ in present world.³

¹<http://www.un.org/en/development/desa/news/population/world-urbanization-prospects-2014.html>

²The White House Fact Sheet on Smart Cities Launch, 2015

³<http://www.ibm.com/smarterplanet/us/en/>

Sr.No.	Smart City	Smart Solution
1	Singapore	Unspecified number of sensors and cameras to track everything from cleanliness to traffic. “Virtual Singapore” a dynamic 3-D model enabling city planners to run virtual tests.
2	Barcelona	First in the world to introduce a solar thermal ordinance. Pioneer in low-carbon solutions.
3	London	Sustainability innovations of congestion tax and a robust transit system. Online payment and contact-less payment available.
4	San Francisco	Connected city initiative enabling residents to locate parking spots. Highest densities of LEED-certified buildings in the United States.
5	Oslo	First to launch commercial smart grid services. Smart LED lighting. Broad sensing network for monitoring traffic levels.
6	Hong Kong	Radio Frequency Identification (RFID) technology in airport and the agriculture supply chain. Adoption of smart cards
7	Copenhagen	Use of renewable energy to supply residents with sustainable heating and cooling. Cycling culture.
8	Helsinki	Transparent and open data. On-demand bus service.
9	Vienna	EV charging stations Active bike and car sharing programs Citizens to co-invest in new solar projects in a collaboration with the local energy company
10	Montreal	Real-time traffic monitoring centre for integrated transit planning and routing. Best in smart living category

Table 1- Special Features of Top-rated Smart Cities across the World;

World’s third most densely populated nation, Singapore, which is expected to have 8000 people per square kilometre by the year 2050, has been ranked as the leading smart-city of the year 2016.⁴ With smart city features such as Electronic Road Pricing (ERP) which encourages the use of roads in off-peak hours to avoid traffic congestions, Massive Rapid Transit (MRT) for public transportation and effective water management system, Singapore is aspiring to sense everything that happens in the neighbourhoods, or buildings, by using sensors all over.

⁴Juniper Research, 2016

Smart Buildings in Smart Cities

Smart buildings is typically overlaying an IT network in the building, connecting all traditionally unconnected equipment and applying automated analytics and controls to it. These enabling technologies i.e. Internet of Things (IoT) solutions are characterized by a convergence of information technology and building automation. Smart Building solutions give building owners, operators, and other key decision-makers unprecedented visibility into equipment operations and building use courtesy of the real-time data generated by the sensors, monitors, and controls in a Smart Building solution configuration. The idea is that the smarter the building, the more efficient its operations and maintenance.⁵

Jim Sinopoli is of the opinion that ‘Green buildings are about resource efficiency, life-cycle effects and building performance. Smart buildings, whose core is integrated building technology systems, are about construction and operational efficiencies and enhanced management and occupant functions. So then how green or how environmental friendly is a smart building remains unapproved.’⁶

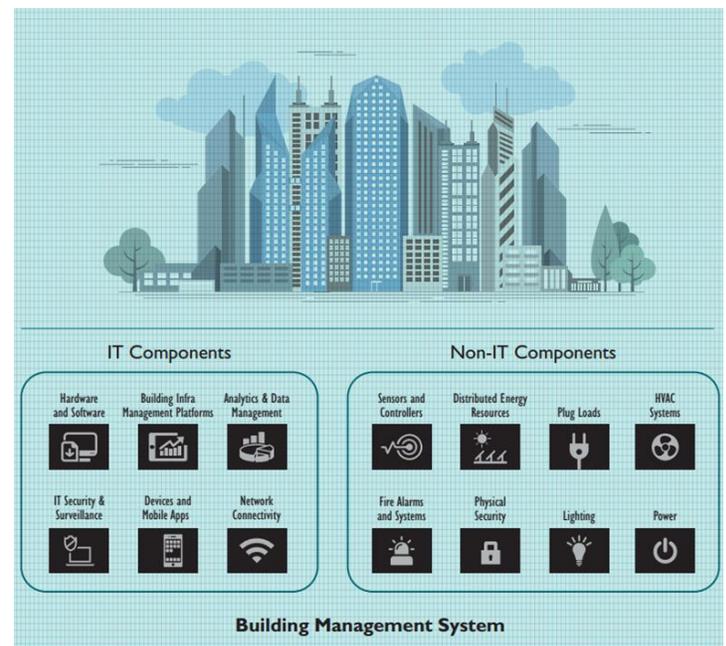


Figure 1- Smart Building Components; Source- IDC, 2015

Global & India-specific Challenges

In the globalized world, the ‘smart city’ concept is employed to employ drones, machines, computers, sensors & meters on a wireless broadband platform; as opposed to providing jobs to the influx of new urban population. It is still questionable whether this kind of shift is adaptable in India yet.

“Smart-city solutions need to be customized and not directly adopted from a Barcelona.”

⁵‘Smart Buildings Enable Smart Cities’, Future Thought of Business, Wipro, 2016.

⁶‘How do Smart Buildings make Buildings Green?’ by Jim Sinopoli, 2007.

- Purushottam Kaushik, Managing Director, Cisco Systems, India

Although the 'smart city' movement is addressing the urban context in general, it cannot be said that this is an architectural epoch, or a node in the time-line of history of Urban Design; it is rather, an epoch in the urban governance and management, or a mass information technology movement; it cannot be enveloped under the term 'urban design' as it is an urban-level application of information technology, and application of urban planning principles that would support the ICT and data storage and monitoring. The smart-cities are the urban centres where application of data and information impact the design, sustainability and resilience of future cities.

"The word 'smart' is used a lot for cities already, but that's limited to technical data—sensor inputs, control systems, apps. Cities need to be responsive- this is a human-focused approach, where citizens can give feedback on the functioning of the city to those who run it."

- Gerhard Schmitt, Professor of information architecture, ETH Zurich

A consumer-specific concept, these new breed of cities aim at becoming *centres of development*, in competition with each other, capable of bank-ability and profit generation. The success of cities also relies on them becoming centres of consumption. In these cities, which are becoming centres of rising salaries and even higher rents, construction of real estate finds growth towards the fringes, bringing in gentrification and an increase in carbon-footprint.

This growth of cities has its benefits for multicultural expression, technological innovation and economic growth—cities already account for 70% of global GDP. However, it will also present a diverse number of challenges: congestion, increased greenhouse gas emissions, sewage overflows, growing crime rates, potential societal and cultural clashes and countless other issues associated with increasingly crowded spaces and the new IT movement.

With the city becoming smart and the invent of the Internet of Things (IoT) solutions there are concerns and risks associated with its adoption. With organizations rushing to market with smart solutions, there is a lack of adequate concern for security, leaving those who deploy the solutions vulnerable to attack. With the smart city market projected to exceed \$1.5 trillion in the next five years, there is clear incentive for IT organizations and manufacturers to rush development and general availability of next-generation IoT devices. As a result, security may be overlooked.⁷

In addition to the possibility of intentional breaches, the risk of human error should be a major concern, as public workers are typically inexperienced with the complex technology associated with a smart city. In addition to threats from outsiders, internal

error is possible in a smart city as complex technology is deployed throughout what are traditionally manual services. The amount of data collected and shared by the city also raises privacy concerns and calls into question the ethical use of information technology. every connection creates a new attack vector for a hacker to infiltrate and take control. This kind of high-level technology may prove challenging to an untrained professional, making mistakes more likely. While an internal error historically would be limited and inconsequential, adding interconnectivity across an entire city could magnify even a minor mistake and threaten public safety across entire regions.

There are also significant challenges involved with educating an entire population on the risks of living and working in a smart city. Many users do not have the time or the interest to learn about their personal devices, let alone those that make up an entire infrastructure. All such scenarios could result in massive financial damages, loss of proprietary information, disruption of critical infrastructure and even physical harm to citizens.

The major challenge India is facing in adopting this global initiative is achieving the required level of city infrastructure with respect to transportation (public & private), education, water supply and sanitation, healthcare and other city-specific basic infrastructure provision to add smartness to. Apart from this, the financing is a major challenge. Although the Government of India has allocated Rs. 500 crore to each smart-city project, it is challenging for the same amount to be allocated for the city by the State Government. The sum of Rs. 1000 crore would not be sufficient for the development aligned in the proposals. Retro-fitting the existing infrastructure would also require capital investment, and would vary from city to city. The total investment in smart cities in India over a period of 20 years sums up to 7 lakh crores (with an escalation of 10% each year).⁸

Ethno-linguistically, India can be sub-divided into many small regions. Since cities in India have cosmopolitans and the local people, it is a challenge to develop the ICT and citizen engagement tools in multi-lingual format. Since under the present set-up, only English and Hindi are the language options available, it is a challenge to support citizens from different linguistic backgrounds living in the same city.

Despite of all these challenges, the names of 20 short-listed cities were announced by the Ministry of Urban Development (by Urban Development Minister Hon'ble Mr. Venkaiah Naidu) on 28th January, 2016, which will receive financial support from the Government of India for the Smart City Proposals they developed in partnership with their citizens during the Challenge process. Pune's smart city proposal was ranked 2nd amongst a total of 97 entries.

Pune, also known as the 'culture capital of Maharashtra', is home to more than 5 million number of people. Pune, an educational hub, attracting a number of students from different parts of not only Maharashtra and other parts of India, but also students from the MENA region. Pune has established itself as

⁷ <http://www.rmmagazine.com/2015/12/01/smart-cities-weighing-the-risks-and-rewards-of-connecting-communities/>

⁸ <http://realty.economicstimes.indiatimes.com/realty-check/the-top-10-implementation-challenges-for-smart-cities-in-india/776>

a IT hub, having offices of all the top IT companies; it also is a favourable city to new businesses, start-up ventures and entrepreneurship. With a strong manufacturing base in the automobile sector, Pune earns a fraction of the country's economy.

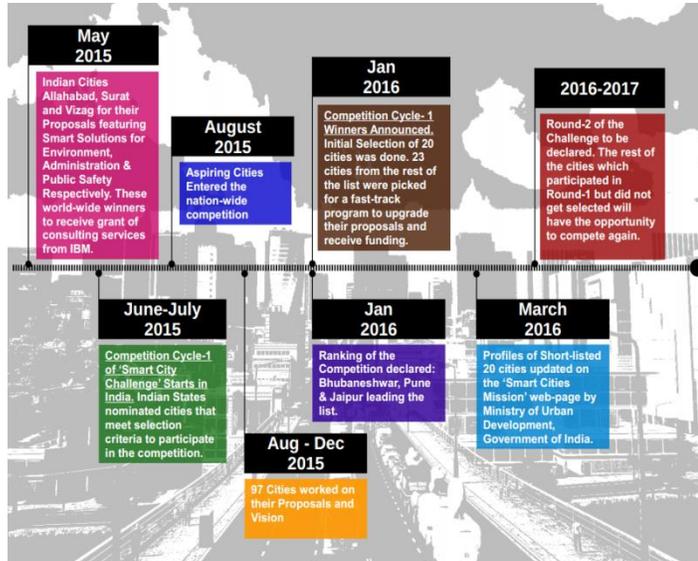


Figure 2- Timeline of India's Smart City Movement;
Source- <http://www.smartcitieschallenge.in/>
Graphical Representation- ShivaniSatpathy

Although it is great breakthrough for Pune to be selected as one of India's forthcoming smart cities, the interventions have to be identified and initiatives have to be taken in the necessary directions. There are certain pre-requisites for a city to graduate and mature to the status of a 'smart city'. Does Pune have those pre-requisites? Is Pune 'Future Proof' or at least functional-at-it's-best at present? What are the strategies that can be adopted for Pune to reach a stage where it can head towards becoming a smart city?

Salient Features of Pune's Smart City Movement & the Challenges: Perils of an invasive technology

Pune, being the second largest city of Maharashtra and the ninth most populous city of India, has its own set of challenges to attend to at the infrastructure, governance, opportunities and environmental level.

Since most of the cities are old, and do not have proper drawings/ cartographic data/ city development plan with all the infrastructure mapped out to the minutest detail, the process of development will have delays. For example, without a mapped water supply and sanitary system for Pune, it is difficult to have early leakage detection and efficient water management. This data could be captured and put online (if it doesn't harm anyone) so that it could be utilised for research purposes and citizen participation.

To access the online data, ICT and data storage and monitoring, the smart-city proposal should aim to provide 24 x 7 utility services such as electricity, internet, telephone and water.

1. Population, Pollution and Temperature Rise

Population growth is one of the most crucial drivers of urbanization. The period from 1990 -2010 has seen the highest urbanization in Pune.

Research has shown that the adverse effect of urbanization on

Region	Population (Million)				Employment (Million)			
	2007	2011	2021	2031	2007	2011	2021	2031
Pune Municipal Corporation	2.97	3.34	4.40	5.63	1.11	1.35	1.78	2.36
Pune Cantonment	0.11	0.12	0.13	0.14	0.04	0.04	0.05	0.05
Khadki Cantonment	0.12	0.12	0.13	0.15	0.04	0.04	0.05	0.05
Pimpri-Chinchwad Municipal Corporation	1.42	1.74	2.75	4.10	0.54	0.72	1.26	1.89
Rest of the PMR	0.70	0.79	1.07	1.39	0.25	0.29	0.39	0.50
Total Pune Metropolitan Region (PMR)	5.31	6.11	8.48	11.41	1.98	2.44	3.52	4.85

Source- 'Comprehensive Mobility Plan for Pune City' by Pune Municipal Corporation

temperature has been more pronounced in the country in the last decade. In Pune, the anomaly in temperature has seen the shift from 0.27 to 0.73 from 1971 to 2010. The air pollution in Pune is 1.5 times more than the national standards. Only 55% of waste generated in the city is treated and the rest 45% is left in to the rivers. 40% of the population of the city lives in slums. The population of Pune during the last four decades grew at an average annual rate of over 3.64 % against the national average of 2.1% and state average of about 3.3 %.

2. Unemployment & Gentrification

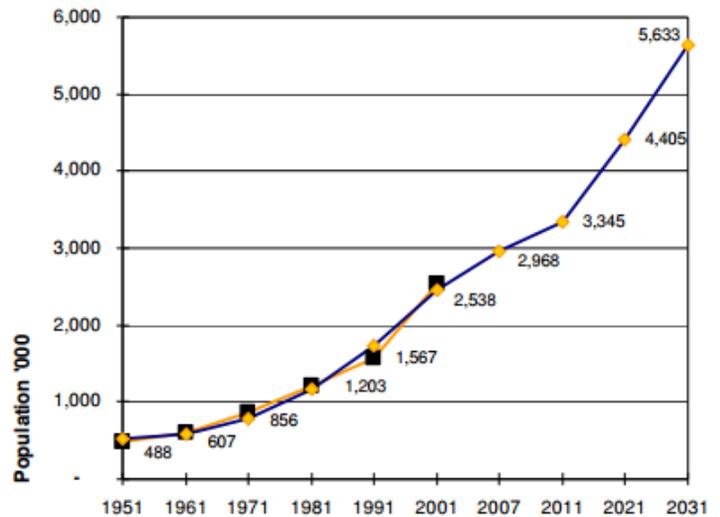


Figure 3- Projection of Population Growth; SOURCE- 'Comprehensive Mobility Plan for Pune City' by Pune Municipal Corporation

Pune has an unemployment rate of 3.29% against the national average of 3.4%.⁹Also, Pune has the 8th largest metropolitan economy. The per capita income of Pune is the sixth highest in the country.

The growing economic activity has resulted in increase of property value in the core areas of the city & increase in rents, resulting in gentrification. Although the city does not have a high rate of unemployment, and offers a very good environment to promote jobs and start-ups, the figures in the 'Projected

⁹Unit Level Data of National Sample Survey Organization, Employment and Unemployment Situation in India, 68th Round, 2011-12

Population and Employment’ by PMC do not look very promising.

Also, the slum population of Pune has increased at an alarming rate, causing high-density low-quality living. And the radial expansion of city as a result of gentrification is affecting the environment and traffic management.

3. Accessible Technology

Only 22% of the households in Pune have computers with internet access. If the citizen services like grievance redressals, exchange of information communication technology, various G2X services (like Government-to-Customer and Government-to-Business services), various public internet booths and kiosks need to be opened.¹⁰

These technologies may be made available on different mobile phone operating systems (like Android, Windows, iOS etc.) as apps.

4. Pedestrian & Traffic Infrastructure

Pedestrian and cycling infrastructure does exist in many different parts of Pune. But most of it is unusable due to unawareness that is prevalent amongst citizens. Also, during peak hours of traffic, it may be noticed that the NMT corridor gets occupied by two-wheelers. In such a situation, adding hundreds of kilometers of NMT infrastructure would not work unless there is citizen participation and monitoring with penalties or tickets issued to people who do not comply.

Women tend to use the pedestrian infrastructure in a way different to men. Special attention has to be given while designing city infrastructure considering the safety and security of people across various sections and genders.

It is a struggle for people on wheelchairs and other disabilities who have little or no mobility on the city roads. The roads are uneven and have potholes, have discontinuous pavements, absence of ramps and handrails.

5. Pune and Industrialisation

Pune’s industrial growth barely spans over five decades. Earlier the city had no local tradition of large scale trade or commerce nor were there any organized industries. Deccan paper was found in 1888, Pune Mills in 1983, in 1908 a glass factory funded by ‘paisa funded’ was started to boost swadeshi industries. In 1869, ammunition factory and in 1940, explosive factory was started in Khadki. Kirloskar Oil Engines marked the industrial development in Pune and then with the establishment of MIDC in 1960, the industrial boost in Pune was unstoppable. Pune’s industrial status is now established; where once cattle grazed and farmers chatted under the cool shades of Banyan trees, have sprung up new industrial areas at Khadki-Pmpri-Chinchwad-Bhosari-Kothrud and Hadapsar and on both sides of Pune’s Nagar Road.¹¹

Industrialisation has been a friend to Pune in terms of socio-economic growth. But also affected the land quality and created brown-field sites. It is also a major cause of climate change in Pune.

¹⁰ ‘Re-imagining Pune: Mission Smart City- Detailed Plan to Transform Pune into a World Class Smart City’ by Pune Municipal Corporation

¹¹ ‘Pune: Tradition to Market’ by Jasmine Y Damle

6. Climate Change & Pune Smart City

Thanks to the past decades of successful industrialisation in Pune, the climate of Pune is changing; bordering to become a hot-semi arid climatic region changing from a tropical-wet and-dry climate. As already brought up, the temperature of Pune is showing anomalies.

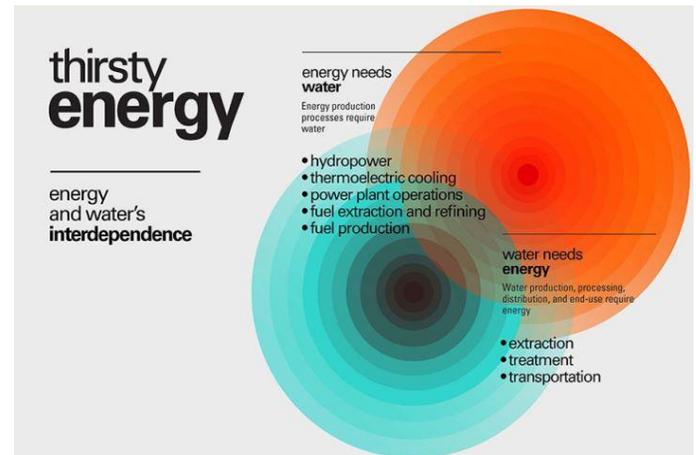


Figure 4- Energy & Water Nexus; Source- World Bank’s ‘Thirsty Energy’ Initiative

“The Water-Energy-Food Nexus describes the complex and inter-related nature of our global resources systems. It is about balancing different resource user goals and interests – while maintaining the integrity of ecosystems.”

The rising population of Pune contributes to pollution, which in turn, raises issues of temperature-rise. It may be noted that for rise of every 1° in temperature, the demand of water for an existing set of population goes up by an amount that is computable, thanks to new technology (WebWIMP, 2013). Increase in temperature would also increase the energy consumption. Which means that there would less amount of energy/water available for irrigation and food production. Then how will Pune cater to the demands of ever-increasing population?

Comparison of Pune’s Issues, the Smart-city Proposal by PMC and Suggestive Measures

Issues	Addressal in the Smart-City Proposal (Courtesy- ‘Pune- SPC’)	Areas of Concern	Suggestive Adaptations
<i>Transportation/ Mobility</i>			
- Significant	- Increased Use of	- Movement of lines for	- Freight Corridors to

<p>Rise in the No. of Private Vehicles.</p> <ul style="list-style-type: none"> - Lack of Public Transportati on options - Massive Congestion s Across the City. - Many Roads declared as One-ways. - Possibility to Increase Road-width Restricted; and not a Solution in Many Cases - Lack of Ring Roads. - Average Trip Length of Everyday Commuters for Job:- 10km - Limited Pedestrian and Cycling Infrastructu re 	<p>Public Transport from 18 to 30% in 5 years, and to 50% (benchmark) by the year 2030.</p> <ul style="list-style-type: none"> - ITMS and Adaptive Traffic Control within 5 years. - Street, Junction and Footpath Redesign and Implementati on. - Public Transportati on Options like BRT & Metro, in 5 years. - Creation of 2 Ring Roads in Next 5 Years to Address 50% of Bypass Traffic and Redirect them. - Increase the average trip share of Non-Motorised Transport by 40%. - Creation of 60kms of footpath and 42kms of cycle track. 	<p>trucks, HMTVs and Freight Vehicles could cause traffic disruption.</p> <ul style="list-style-type: none"> - Traffic Malpractices to be closely monitored, eg. Using the pedestrian infrastructure to bypass traffic at signals. - Parking Solutions in Dense Areas to be Explored. - Existing BRT is criticized for faulty design, facing logistics issue. 	<p>be detailed out.</p> <ul style="list-style-type: none"> - ITMS and Adaptive Traffic Control to have V2x model (V2V and V2i) to detect and solve congestion problems. - In Denser areas, (eg. KasbaPeth), the dwellings could have a commercial street on one side, and residential street on the other side. Parking options for commercial streets to be explored for busy days and hours. - Levy of Charges for Long-Distance Commute (monitored using ICT)
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<i>Issues</i>	<i>Addressal in the Smart-City Proposal (Courtesy- 'Pune- SPC')</i>	<i>Areas of Concern</i>	<i>Suggestive Adaptations</i>
<i>Inequality of Water Distribution</i>			
<ul style="list-style-type: none"> - 85% of citizens get more than 150 lpcd water. - 14% of citizens get less than this benchmark of 150 lpcd specified in National Building Code, 2005. - Lack of Water Metering in Certain Areas leading to Consumption in Excess. - Lack of Water Infrastructure in Certain Areas; Lack of Leakage Detection Facility. 	<ul style="list-style-type: none"> - Putting up of Smart Meters, Building Reservoirs at Balewadi and Baner, laying of approx. 50kms pipe in the Aundh-Balewadi-Baner (ABB) area, setting up of systems for waste water recycling etc. 	<ul style="list-style-type: none"> - 'Future-proof' piping system and infrastructure . 	<ul style="list-style-type: none"> - Water Demand Calculation to be carried out for future years, keeping in view increase in demand due to rise in population, rise in temperature, increase in business/ industrial activities etc.
<i>Housing</i>			
<ul style="list-style-type: none"> - Migration of Population to Pune: increase in slum dwelling population. - Lack of Sufficient Affordable Housing Infrastructure 	<p>Construction of 20,000 affordable houses every year to make Pune slum-free by the year 2025.</p>	<p>Issues that might come up due to lifestyle and cultural gaps. Location of these affordable housing projects- could follow 'Neighbourhood Concept', catering to</p>	<p>Case study of Slum-Rehabilitatio n Concepts in India. Citizen Involvement and Willingness to adapt.</p>

		the nearby service sectors. - Sustainable construction principles to be adapted, and verified even after construction, from time to time.	
<i>Issues</i>	<i>Addressal in the Smart-City Proposal (Courtesy- 'Pune- SPC')</i>	<i>Areas of Concern</i>	<i>Suggestive Adaptations</i>

discharge of untreated sewage. - Illegal hill cutting around Pune for Suburban Real Estate and Construction - resulting in landslides, floods and harm to ecosystem and environment.		the same not reflected.	
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The coordination between Central and State government and Local bodies has to be thorough for successful execution of the smart city project in Pune for timely clearances and approvals. Although migration to urban centres is the indicative of economic growth for the city as well as the people living in it, the smart-city movement is a pump-up to head for a consumer-based economy; which is reliant on investments for its bright future. It's the environment that pays for the consumption of the city and the society. The smart-city movements by various cities are synonymous to marketing strategies; trying to attract more population to them; it is synonymous with Ebenezer Howard's urban magnet theory- 'creation of magnets people would want to come to' (but this time, totally without the country-side). How about just retro-fit the infrastructure of the city and make it future-proof, make the city go digital, and empower the rural sector, and the agri-division? That will help keep the food-shortage at check, while dealing with the increasing population of the cities.

Conclusion:-

The policies and urban-planning strategies will have to be looked up in relation to this smart movement. A shift to renewable sources of energy seems to be a good solution to avoid the water, energy and food problems; as well as reduce carbon emissions, thereby reducing the carbon footprint of Pune and achieve a sustainable scenario for the 'Oxford of the East'.

Reference:-

- i. <http://www.un.org/en/development/desa/news/population/world-urbanization-prospects-2014.html>
- ii. *The White House Fact Sheet on Smart Cities Launch, 2015*
- iii. <http://www.ibm.com/smarterplanet/us/en/>
- iv. *Juniper Research, 2016*
- v. *'Smart Buildings Enable Smart Cities', Future Thought of Business, Wipro, 2016.*

<i>Environment</i>			
Growth of Industrialisation, increasing brown-field areas, pollution of MulaMutha river - Reduction in tree-cover - Degradation of Air Quality - Sound Pollution due to Traffic. - Has 7% open spaces. Lacks the benchmark level of open spaces (of 15%- laid by the Ministry of Environment). - Pollution of MulaMutha due to	- Elimination of open defecation. - Cleaning of MulaMutha river, and develop the riverfront. - Traffic reduction to manage air and sound pollution. - Clean and green energy sources to be utilised by 15-20%.	Other effects on environment (like rise in temperature, global warming, change in micro-climate of Pune, carbon footprint calculation etc.) to be addressed in detail. No concerns about pollution and environmental concerns due to industrialization outlined in the proposal. Concerns about illegal modification or alteration of topography not covered; or building bye-laws and policies in relation to	Conduction of Environmental Impact Assessment (EIA) for each Smart-City Project and determine its carbon footprint. Also, carry out thorough EIA before sanctioning set-up of any industry and be cautionary. Industries could be issued directives to adopt clean energy, or at least a good %age of it. Policies and Bye-laws to be looked up and reviewed.

vi. *'How do Smart Buildings make Buildings Green?'* by Jim Sinopoli, 2007.
vii. <http://www.rmmagazine.com/2015/12/01/smart-cities-weighing-the-risks-and-rewards-of-connecting-communities/>
viii. <http://realty.economictimes.indiatimes.com/realty-check/the-top-10-implementation-challenges-for-smart-cities-in-india/776>

ix. *Unit Level Data of National Sample Survey Organization, Employment and Unemployment Situation in India, 68th Round, 2011-12*
x. *'Re-imagining Pune: Mission Smart City- Detailed Plan to Transform Pune into a World Class Smart City'* by Pune Municipal Corporation
xi. *'Pune: Tradition to Market'* by Jasmine Y Damle