

Case Study on Smart City Projects in India: An Analysis of Nagpur, Allahabad and Dehradun

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ABSTRACT

Nagpur has emerged as the topmost smart city in India. In just five months, Nagpur has beaten other cities chosen before it to get the best implementation of smart city plan. A recent stock-taking exercise conducted by urban development ministry has revealed that Nagpur, though chosen as a smart city in September 2016 much after 33 smart cities in two previous rounds has achieved the best investment conversion ratio. India's smart city program hopes to revolutionize city life and improve the quality of life for India's urban population. In the absence of a zonal plan, many parts of Dehradun have witnessed haphazard development over the years, which has already caused much damage to the vision of a planned smart city. Smart City would require smart economy, bright people, smart organization, smart communication, smart engineering, smart transit, fresh environment and bright living. Nevertheless, with mass migration leading to basic problems, like water shortages and overcrowding, the rate at which these cities will be developed will be the key. Several initiatives are being led by the Government of India to convert 100 Cities into Smart Cities. Government to Actively Use PPP Route and Encourage FDI for Effective Implementation of Smart Cities Project in India.

KEYWORDS

Smart City, Infrastructure Financing, FDI, PPP

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1 INTRODUCTION

As the global population continues to grow at a steady pace, more and more people are moving to cities every day. Cities accommodate nearly 31% of India's current population and contribute 63% of GDP (Census 2011).

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Urban areas are expected to house 40% of India's population and contribute 75% of India's GDP by 2030. This requires comprehensive development of physical, institutional, social and economic infrastructure. All are important in improving the quality of life and attracting people and investment, setting in motion a virtuous cycle of growth and development. Development of Smart Cities is a step in that direction.

Smartness in city means smart design, smart utilities, smart housing, smart mobility, and smart technology. There is need for the cities to get smarter to manage complexity, increase efficiency, reduce expenses, and improve quality of life. Smart Cities focus on their most pressing needs and on the greatest opportunities to improve lives. They tap a range of approaches - digital and information technologies, urban planning best practices, public-private partnerships, and policy change - to make a difference. They always put people first.

In the approach to the Smart Cities Mission, the objective is to promote cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of 'Smart' Solutions. The focus is on sustainable and inclusive development and the idea is to look at compact areas, create a replicable model, which will act like a lighthouse to other aspiring cities.

Smart Cities Mission Strategies

- Pan-city initiative in which at least one Smart Solution is applied city-wide
- Develop areas step-by-step – three models of area-based developments
- Retrofitting,
- Redevelopment,
- Greenfield

2. OBEJECTIVE OF STUDY

The study mainly focuses an effective analysis of SWOT based on the smart city, to promote the sustainable development of urban development of the mentioned cities.

3. SWOT analysis of Nagpur, Allahabad and Dehradun Strengths

Dehradun

1. **Strategic location:** Dehradun is strategically located and has good connectivity to New Delhi by air, rail and road. It serves as

gateway for the key tourist destinations of state. The floating population recorded for Dehradun is 20,000 people per day.

(Source: city development plan, 2015)

2. City of Schools: Dehradun is an important educational hub of India embraced with large number of leading public schools and colleges in both government and private sector with over 1.70 lakh students enrolled. Dehradun is considered as the citadel of prestigious public schools such as The Doon School, Welham Girls & Boys School, Convent of Jesus & Mary, Rashtriya Indian Military College.

3. Literacy rate: The average literacy rate is over 84%, which is much higher than the national average of 74%. This augments the quality of human resource available in the city

4. Dehradun is anchor to organizations of national importance viz. Geological Survey of India, Wadia Institute of Himalayan Geology, Indian Institute of Remote Sensing, Forest Research Institute, Indian Military Academy and Headquarters of ONGC, Survey of India

5. Colonial age heritage structures viz. Astley hall, Clock tower (hexagonal form), Jesus Mary Church, Forest Research Institute (FRI), IMA, Khalanga War memorial. Ashoka's Rock Edict (under ASI) & Ashwamedh Sthal of Raja Sheel Barman (Under ASI).

Nagpur:

1. Strategic location- Nagpur, the geographical center of the country enjoys seamless road, rail and air connectivity to major urban centers such as Delhi, Mumbai, Pune, Hyderabad, Bangalore and Chennai. Riding on its geographical location and a robust connectivity profile, Nagpur has the potential to become a key logistics hub of central India.

2. Rich in Natural Resources- The presence of perennial rivers such as Pench, Kanhan and Vena endow the Nagpur region with abundant water resources; Vena dam has a capacity of 23.5 million cubic meters and the total line storage capacity is 380 million cubic meters. Nagpur is also one of the greenest cities in the country. For every 10 persons, there are 9 trees in Nagpur. Additionally, industrial land available in Butibori (Asia's largest industrial estate) & other industrial areas can propel industrial growth with industrial land prices being only 10% & 14% of the industrial land prices in Thane & Pune respectively. A variety of minerals such as coal (23% of state's reserves), manganese (45% of state's reserves), & limestone & iron ore (76% state's reserves) are found in the Nagpur Metropolitan Region.

3. Competence to implement PPP projects successfully- Nagpur is perhaps the only city in the country with a broad-based PPP implementation competence. Nagpur's marquee PPP success is the 24*7 water supply project pilot project. With the immense success of the pilot, the project is now being scaled up to the entire city and will be completed by 2019. In addition,

Nagpur has also implemented projects such as recycling and reuse of 130 MLD wastewater, installation of LED street lights in place of conventional street lights, city bus operations and collection and treatment of solid waste management. The city has cleverly leveraged private sector efficiencies for efficient service delivery.

4. Established medical and education hub of Central India- With nearly 625 hospitals, the city has a total bed capacity of 12,000. With 3 beds per 1,000 population, Nagpur is a medical hub for the central India region. With 35 engineering colleges, 3 medical colleges & a host of research & professional education institutions, Nagpur has emerged as the education hub of central India. Reputed institutions such as VNIT, NEERI, IIM-Nagpur, Animal Husbandry & Fisheries University & Nagpur University are present in the city. With the upcoming IIIT and AIIMS, Nagpur will be able to expand on its reputation as an education hub & also facilitate setting up of startups & other entrepreneurial ventures.

5. Vicinity of Tiger tourism hot-spots- There are an estimated 243 tigers and 3 Project Tiger within the Vidarbha region. The region also has 4 national parks which attracts tourists in large number (520,000 in 2009). Nagpur is the key access point for reaching these tourist locations that add to city's economic potential.

6. Experience in set up and management of SPV- The NMC has already set up an SPV in the form of the Nagpur Environment Services Ltd. for implementing the 24*7 water supply project in Nagpur. In addition, the Nagpur Improvement Trust is also akin to an SPV that has been executing urban development projects in the city's periphery. Thus, Nagpur has substantial experience in setting up & management of SPVs.

Allahabad

1 Strong Historical and Cultural Identity: Well established pilgrimage Centre; one of the four sites in India hosting the Kumbh Fair every 12 years;

a) Annually 4 crore visit Allahabad; around 0.3% comprise foreign tourists; over last 5 years there is a 27% increase in tourist inflow. The Maha Kumbh Mela (fair) in 2013 itself hosts close to 7.5 crore visitors (with 3.5 lac foreigners)

b) Fairly large inventory of built heritage comprising of nearly 30 temples of various styles; Ananda Bhawan and other colonial era spaces such as Khusro Bagh; Chandrasekhar Azad Park and Minto Park

c) River shoreline of around 40 kilometers comprising of both Yamuna as well as Ganga.

d) Zonal cultural Centre under Ministry of Culture, Government of India and Prayag Sangeet Samiti promotes Indian music and culture

2 Known Zonal Centre for Higher Education: A number of renowned and premier educational institutions of higher learning present in the city

- a) Allahabad University (central), Motilal Nehru National Institution of Technology, Motilal Nehru Medical College; Indian Institute of Information Technology, GB Pant Social Sciences Institute, Agricultural University and the Allahabad State University
- b) Coaching classes for competitive examinations comprise a major industry in the city.

3. Natural Resource Base of Agricultural Produce and Silica:

Has a history of glass manufacturing works and b) High yield of guava, amla and bananas

4. Well connected Transport and Water:

- a) Rail Connectivity: Located along the rail route of New Delhi – Howrah
- b) Starting point on the proposed National Waterway no. 1 (Allahabad and Haldia)

5. Urban Services Well Developed:

- a) Water supply exceeds National standard of 135 lpcd
- b) High capacity of wastewater treatment & disposal inventory created under GAP and NGRBA schemes, present capacity is over 280 MLD
- c) Integrated solid waste management programmes operational for almost a decade

Weaknesses

Dehradun

1. **Less than expected level of urban utilities:** While the DMC has been taking initiatives towards SWM and sanitation issues, but the identified municipal services are below the expected level to cater to ever increasing migration.
2. **High Population Density:** The population density of Dehradun is 1900 sq. km. persons per sq. km. In 2001-2011, Dehradun had a growth rate of around 32.48%, which is higher than the national average of 7.64% resulting in congestion in the city core.
3. **Ribbon development along major transport corridors:** All the primary radial transit routes, particularly Rajpur Road, Chakrata Road, Saharanpur Road, and Haridwar Road in the city are marked with high density unplanned developments. This leads to poor utilization of the right-of-way, increased travel times, increased air pollution, and reduction in the efficiency of the urban economy
4. **Inefficient Transport & Parking:** 48.1 % of roads in Dehradun are change by on-street parking on both the sides. Weak public transport system has led to plying of Vikrams without permits adding to the level of pollution in the city. There is significant amount of mismanagement in terms of the route planning for the vikrams and city buses

5. **Lack of employment opportunities:** Low workforce participation, in 2011, the workforce participation ratio was about 34:66. The share of main workers is 30% in the total workforce, 4% is shared by the marginal workers, and share of non- workers are 66%. Absence of enough employment opportunities in the service sector in line with the employable population of the city

6. **Dilapidated Heritage structures:** The city boasts of heritage structures of colonial times, which are all in very bad shape due to lack of attention towards preserving them and unplanned growth in the city center

7. **Depleting green cover with negative impact on the weather of the city:** The city located in the foothills of Himalayas, has been traditionally known for its green cover, and excellent weather conditions. The unplanned growth has negatively impacted the green cover of the city and thus the weather

Nagpur

- 1) **Multiple planning institutions & dichotomy in growth-** Nagpur has multiple planning agencies which shape urban growth but in an uncoordinated manner. This has resulted in dichotomous urban growth with a significant portion of the city's population living in unplanned, haphazard & vulnerable areas with paucity of services and a sub-par quality of life.
- 2) **Unplanned & haphazard development-** The eastern periphery of Nagpur is made up of a number of unplanned layouts inconsistent with the Development Plan land-use provisions. It is estimated that there are over 2450 layouts where existing land-use is inconsistent with proposed land-use of the Development Plan of Nagpur. This includes Mauzas such as Nara, Nari, Wanjara, Wanjri, Bharatwada, Pardi, Watoda, Tajbagh, Dighori, Manewada & Somalwada.
- 3) **Inequitable distribution of civic services-** The 2450 unplanned layouts are estimated to house ~30% of the city's population. Being unplanned, these layouts are unable to access civic services & continue to subsist in squalor. Services such as adequate water supply, sanitation & sewerage, public transport and street lighting are hardly available to this section of the city. This has severely affected livability parameters & offers compromised quality of life to the residents of such layouts.
- 4) **Weak public transport system-** Bus services are the only means of public transport available in the city which has led to an increasing number of private vehicles plying on the city roads. Currently, public bus transport caters to only 12% of the commuting population. Despite efforts such as route rationalization & procurement of additional buses, the city has had limited success in shifting its commuting population to the public transport system.

5) **Administrative & operational inefficiencies affecting quality of public service delivery-** While NMC has developed more than 60 e-governance modules, reach of these services is limited. Further, limited convergence & compartmental approach of departments has also affected overall service delivery. The use of IT/smart technology for operations is extremely limited at present and hence it is critical to scale up the use of technology to achieve incremental benefits of improved operations.

6) **Lack of employment opportunities-** Nagpur's economic growth has not picked up pace over the years which has resulted in the young & educated not finding adequate employment opportunities. An estimated 11,000 engineers, ~800 management graduates and ~250 doctors graduate from Nagpur each year; retaining this skilled workforce is a challenge since local employment opportunities are limited.

Allahabad

1. Lack of Integrated strategy to support and Sustain Tourism:

- a) Most of the State support is 'reactive', i.e. responds to specific events and not targeted at maintaining tourism-based infrastructure.
- b) Lack of formal approach to guide visitors on the pilgrimage and other sites in the city

2. **Higher Education Centers do not foster the Local Economy:** Most students move on to other cities and towns after completing education; institutions have limited engagement with industry.

3. **Stagnant Manufacturing and Industry:** a) Most large industrial units have closed down or are exiting the State
b) MSME sector is not supported well in terms of new, emerging areas, viz. skill based support services
c) Limited focus on knowledge based industries

4. Limited Air Connectivity to the City:

Only one airline and single flight servicing Allahabad (from Delhi) - impacts tourism an

5. Urban Form does not Encourage Compact Development:

- a) Most areas show considerably lesser density than what is supported except organic and unplanned built-up areas; very few flattened systems in the city
- b) No provision for mixed use development in master plan;
- c) New residential schemes are heavy on 'plots' of land, and are increasing urban sprawl more than compacting; viability of many line services suspect on account of high sprawl and low density. This is because the development authority is not encouraging redevelopment of high density areas.
- d) 'Own vehicle' centered development - modal share of buses is 8% only; even as motorized trips have an average length of just under 7 km
- e) Only 1% of the road network have foot paths; high instances of on-street parking

- f) Limited focus on street and intersection design; increase in road accidents over last 3 years (844 to 1019); limited signages
- g) New rolling stock for buses has not been acquired since 2009; most buses have reached condemnation stage

Opportunities

Dehradun

1. **Gateway to tourist destinations:** Investment towards promotion & development of facilities catering to floating population could serve as making the city a "Hub" for key tourist cities under Hub & Spoke model wherein the routes to the identified cities could be strengthened, promoting RRTS, implementing the Mussoorie Dehradun Ropeway. Significant volume of tourist footfall could be retained for an extra day in the city by restoration and conservation of the heritage structures in the city and creating places of tourists' interests and information within the city

2. **Infotainment hub (hospitality, vocational, higher education, Information & Entertainment centers for kids and tourist):** Given the high number of schools and educational institutions, policy incentives towards attracting institutions of repute would help to start a Dehradun center. Currently the city has only one IHM, given the hospitality sector growth opportunities in the city, such institutes could be set up. Given the high number of educational institutes, the convergence with GoI schemes viz. skill India could be undertaken through tie-ups with the existing institutes. The city presents the opportunity to set up facilities with informational, educational and entertainment values for the large mass of students and tourists

3. **Qualified employable workforce:** About 75% of the population in Dehradun is below the age of 45 years. Because of high literacy rate & good institutions, the city has good quality of employable population. This provides an opportunity for strengthening employment opportunities in line with strength of the city i.e. in hospitality, tourism related sectors within the city to provide more employment opportunities to captive human resources.

4. **Potential to develop as counter magnet city to NCR:** Situated at around 250 Kms from Delhi and with over saturation of NCR due to immigration, the proposed 4/6 laning of Delhi-Dehradun Highway, and good road, rail and air connectivity of Dehradun with NCR, provides potential for development of the city as counter magnet city to the NCR. NCRPB has already included Dehradun in the list of counter magnet cities to NCR

Nagpur

1) **Potential to become a multi-modal logistics hub with MIHAN playing a key role-** While GST will make Nagpur a cost-effective distribution center, its connectivity via rail, road and air will make it an attractive location for multi-modal logistics activity. The growth of MIHAN will also ensure creation of a diverse economic base propelling all round development in Nagpur.

2) Potential for Transit Oriented Development (TOD) due to Metro Rail project- Two Metro routes of 38 km have been planned across the city. Works for 6 kms are already underway. High density mixed development, through FSI of 4 or more, along the Metro alignment will encourage TOD in areas like Sitabuldi and Jail ward. Shifting the Central Jail will unlock prime real estate, which can be utilized for developing high-density retail / medical / entertainment zones.

3) Availability of government land- A large number of government, industrial & NMC land is available for development. Land along metro corridor (Jail land) & other important locations (Wathoda, Bhandewdi) will be utilized for various purposes. Leveraging the government institutions' land bank can generate resources to fund infrastructure expansion.

5) A host of infrastructure projects will add to city's economic agenda: Implementation of in-pipeline projects: Orange city street project, 142 acre International standard sport complex & sports university complex at Watoda, 100 acre Skill Development Centre at Watoda, Gorewada international zoo & Nagpur-Mumbai super communication expressway will exert much needed push to the local economy.

6) Rejuvenation of water sources due to Nag Riverfront Development- The Nag Riverfront Development project focuses on pollution abatement as well as place making by developing promenades and open spaces for recreation. The pollution abatement DPR has received in-principle funding approval from the MoEF. The Nag River will be rejuvenated through these interventions.

7) Potential to boost tourism- Deekshabhoomi, a much-vaunted Buddhist memorial, can be aggressively marketed as a tourist destination. The Gorewada International Zoo can add to the tourism potential of the city.

Allahabad

1. Organizing and Formalizing the Triveni and Sangam Experience:

- Provision of infrastructure and other amenities in all over the riverfront, positioning the same as a group of 'managed' sites which improves visitor experience; including developing areas for new activities viz. boating;
- Development of a comprehensive and easily accessible information base of cultural elements, potential itinerary for visiting and support services that would essentially (1) market Allahabad's cultural and historical identity, (2) facilitate smooth visits and passage of tourists and pilgrims alike.

2. Positioning the other New Allahabad

- Areas of the city, which generate economic activities may also be used to attract tourists and visitors; viz. Civil Lines, Katra as elements of 'contemporary & living culture'
- Certain old and run down areas offer potential to be resuscitated and redeveloped (urban renewal) as centres of

mixed use supporting local economic development; Government lands – which are vastly underutilized.

c) Option for retrofitting/ adaptive re-use of old premises with a Victorian character, viz. Nagar Nigam premises for mixed use and commercial capitalization.

3. Rich deposits of Silica

Even though the glass industry has all but closed, potential lies in ceramic and other such materials which now have advanced applications in power, aerospace & defense.

4. High Yields of Agro Produce, Particularly Guavas and Amla:

Potential for development of cooperative or privately owned manufacturing units for fruit based products

5. Making Education Work for the City:

- Establishing centers for excellence, innovation hubs and R&D centres within Allahabad University and other similar setups.
- Fostering start-ups, industry – academia linkages for laboratory testing and application development
- Improving market access and outreach of major university setups to improve employability

6. Connectivity:

- AAI fund (Rs.300Cr.) sanctioned for Modernization of Airport to increase tourists' footfalls.
- Land available for Infrastructure Development and ILS system being implemented for night landing.

7. Urban Amenities:

- City-wide implementation and up-scaling of Hari-Bhari PPP initiative for Door To Door waste collection planned. The initiative has potential to support waste to energy initiative.
- Availability of funds under Urban Transport Fund, Employment Generation and Self- income development scheme by DUDA and development of ITMS plan.
- Redevelopment of unutilized and encroached "Nala's " (open drains); and creation of recharge ponds within the city
- A metro rail is proposed (feasibility study ongoing) to be taken up within the city

Threats

Dehradun

1. Depleting environment resources: There is a decline in the urban green spaces in Dehradun city from 22.98% of total area in 2004 to 15.13% in 2009. Additionally, growing environmental pollution personalized vehicles has adversely affected the livability in the city

2. Possibility of unplanned growth along the Haridwar:

The city has found natural expansion along the Haridwar road, and with the ongoing strengthening of the highway; there is high chance of further unplanned growth along the corridor

3. **Crime rate:** The large section of non-working population can give rise to an increased crime rate in the city if not channelized productively

4. **Migration:** There is likelihood of large-scale migration to the city from the nearby peri-urban areas and other parts of state putting strain on its infrastructure and creating further housing shortages.

Nagpur

1) **Presence of unauthorized layouts in the eastern periphery** - A large number of unauthorized layouts exist on the eastern periphery of the city abutting the Bhandara road. The Bhandara road is fast emerging as a warehousing and logistics center which will attract population due to employment opportunities. Abysmal quality of life in these unauthorized layouts can limit the growth of a logistics hub along the Bhandara road.

2) **Brain-drain phenomenon-** The young & educated are increasingly moving out of Nagpur in search of employment. The lack of employment opportunities compels the youth to migrate out of Nagpur to other centers. This out-migration is evidenced by the Census 2011 figures; the decadal growth rate declined from 27% to 19%.

3) **Underdevelopment in MIHAN-** The industrial growth in Nagpur has not been dynamic enough to create a vibrant economy. Additionally, Multi-modal International Cargo Hub Airport Nagpur (MIHAN) was expected to fuel the economic growth of Nagpur with an estimated 125,000 direct jobs. However, the slow growth of MIHAN has further accentuated the lack of employment avenues in Nagpur. With the political capital that Nagpur currently has, growth of MIHAN can be accelerated. However, if the growth in MIHAN continues to be slow, Nagpur will continue to witness out-migration which can impact the city's all-round growth prospects.

4) **36% population lives in slums;** supply of affordable housing limited- Despite attempts to provide extensive affordable housing, 36% of Nagpur still lives in slums. This indicates that the supply of affordable housing has not kept pace with the demand. Efforts under the Slum Rehabilitation Authority (SRA) and Housing for All should doggedly focus on providing good quality of life and affordable housing.

Allahabad:

1) Flooding in Ganga; encroachments within flood plain;

2) Continuing practice of development of housing schemes resulting in uncontrolled urban sprawl and an imbalanced property market; ad-hoc changes in land use with limited land consolidation.

3) Increasing inventory of para-transit and unorganized sector in transport leading to skewing of modal share and trip lengths; cycle based trips have an ATL of 4.3 km

4) Minimal focus on affordable housing; last two years have seen only about 850 units produced

5) Over-dependence on the existing tube-wells for water supply will lead to depletion of water levels.

CONCLUSION:

Nagpur has emerged as the topmost smart city in India. In just five months, Nagpur has beaten other cities chosen before it to get the best implementation of smart city plan. A recent stock-taking exercise conducted by urban development ministry has revealed that Nagpur, though chosen as a smart city in September 2016 much after 33 smart cities in two previous rounds has achieved the best investment conversion ratio. India's smart city program hopes to revolutionize city life and improve the quality of life for India's urban population. In the absence of a zonal plan, many parts of Dehradun have witnessed haphazard development over the years, which has already caused much damage to the vision of a planned smart city. Smart City would require smart economy, bright people, smart organization, smart communication, smart engineering, smart transit, fresh environment and bright living. Nevertheless, with mass migration leading to basic problems, like water shortages and overcrowding, the rate at which these cities will be developed will be the key. Several initiatives are being led by the Government of India to convert 100 Cities into Smart Cities. Government to Actively Use PPP Route and Encourage FDI for Effective Implementation of Smart Cities Project in India. The government is concentrating on encouraging Public Private Partnership (PPP) for successful implementation of the smart city project in India. Financial and IT services sectors are on the priority list of the government to garner investments from leading companies such as Cisco, EMC, GE, IBM, Bajaj, etc. in coming years. Few of the major companies that are currently involved in project planning of these cities include Halcrow, Synoate, Knight Frank and AECOM India. The real challenge before the Government is to build inclusive smart cities for all its residents, regardless of whether they are rich or poor. Creating a smart city is not just about creating the physical infrastructure — roads, clean water, power, and transport. It is desired that public private partnerships (PPP) will deliver, but the mechanism appears to require a lot of plucking in order for it to work, a fact recognized in the recent Budget. The big challenge will be to create self-sustaining cities, which create jobs, use resources wisely and also train people. The idea should be to make cities work for the masses. India has to now take an important decision in the context of creating smart cities. It has to determine if it desires to opt for making new cities or upgrade existing ones.

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