

## GLOBAL JOURNAL OF ENGINEERING SCIENCE AND RESEARCHES SOME KEY CHALLENGES AND AREAS OF SMART CITIES IN INDIA: CASE STUDY ON ONE OF THE SMART CITY IN TELANGANA STATE

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### ABSTRACT

Cities are engines of economic growths, especially for a vast and developing country like India. As per the Census 2011, nearly 31 % of Indian population lives in urban areas and contributes 63 % of the Gross Domestic Product (GDP). As the population India's shifts to urban territories, policymakers are pressed for answers to overcrowding, pollution, budget limitations, aging infrastructure, resource constraints and the requirement for continuing growth. India has recently committed to the development and construction of 100 Smart Cities to meet the demands of its rapidly growing and urbanizing population. This effort will include construction of new municipalities and renovation of existing cities as the rural population shifts into urban areas. Smart city concept can be used for transforming any city into a smart city. Smart cities have various overwhelming advantages & it a win –win situation for both, government & the citizens. Smart solutions can be helpful in controlling the ever increasing population in the cities. This paper focuses on the concept of Greater Warangal smart city on water, waste water, solid waste management, Health care, Transport as the Government of India launched the smart city project for developing 100 smart cities (now 98 smart cities) in the country and also concentrates on the challenges as well as the key areas for development of smart cities in India along with the case study of Greater Warangal smart city in Telangana State..

**Keywords:** smart economy, smart mobility, smart people, smart environment, smart living, smart governance.

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### I. INTRODUCTION

Most Cities of India do not have master plans therefore; unplanned urbanization is of great concern especially for provision of infrastructure and services. Most of urban areas are they are neither rural nor urban. As cities expand, the urban areas, which are mostly unplanned areas, are brought into the cities' jurisdiction cities, as retrofitting and redevelopment is a much more difficult exercise.

Recognizing that India is at present experiencing a high pace of urbanization and movement of its citizens from smaller towns and villages to urban areas, Finance Minister Arun Jaitley set aside 7600 Crore (\$1.24 billion USD) for the creation of 100 Smart Cities in the maiden budget that the new government presented to Parliament in July 2014. This plan envisions not only the building of new cities from the ground up but also modernizing older cities.

Many definitions of “smart city” physical, social, institutional and economic infrastructure while ensuring centrality of citizens in a sustainable environment;”refer to key characteristics defined by distinct factors (e.g., smart economy, smart mobility, smart people, smart environment, smart living, smart governance); and concentrate on the vital utilization of new technology and innovative approaches to improve the efficiencies and competitiveness of urban areas.

Smart Cities are the integration of information technology, telecommunications, urban planning, smart infrastructure and operations in an environment geared to maximize the quality of life for a population.

Cities are built on the three pillars of Infrastructure, Operations and People. In a Smart City, not only is each one of these pillars infused with intelligence, but more importantly the pillars work in an interconnected and integrated

fashion to utilize resources efficiently. For instance, a Smart City distribution infrastructure will be based on Smart Grid technologies, which will integrate with local power demand patterns, grid supply variations, and a well-defined operational process –to manage the available energy most efficiently.

## **II. LITERATURE REVIEW**

GIS Steering Smart Future for Smart Indian Cities by Anuj Tiwari & Dr. Kamal Jain (2014): The concept of a smart city is a new one. This paper depicts the smart city projects in India namely LAVASA: SMART HILL CITY & GIFT: GUJARAT INTERNATIONAL FINANCE TEC-CITY.

The Smart City Cornerstone: Urban Efficiency by Charbel Aoun (2013): This paper shows a five stages approach for changing over our urban centers into more efficient and sustainable places to live.

1. Setting the vision
2. Bringing in the technology
3. Working on the integration
4. Adding innovation
5. Driving collaboration

Smart City and the Applications by Kehua Su, Jie Li, Hongbo Fu (2011): This paper chiefly concentrates on the recent research on concept of smart city. The relationships between the smart city and digital city are also described in this paper. The various application systems for a smart city are:

1. Construction of a Wireless City
2. Construction of Smart Home
3. Construction of Smart Transportation
4. Smart Public Service and Construction of Social Management
5. Construction of Smart Urban Management
6. Construction of Smart Medical Treatment
7. Construction of Green City

*Smart Cities can be identified along six main dimensions (IBM Smart Cities: [www.ibm.com/uk/cities](http://www.ibm.com/uk/cities)), (Giffinger, R et al, 2007). These axes are*

Smart Economy - Innovation and Competitiveness  
 Smart Mobility- Transport and Infrastructure  
 Smart Environment - Sustainability and Resources  
 Smart People - Creativity and Social Capital  
 Smart Living - Quality of Life and Culture  
 Smart Governance - Empowerment and Participation

## **III. OBJECTIVES OF THE STUDY**

1. To study the design concept of smart cities.
2. To study the key areas for the development of smart cities.
3. To explore the challenges faced during the development of smart cities.

## **IV. RESEARCH METHODOLOGY**

This current study has been exploratory in nature where pertinent information has been gathered from various secondary sources of data, such as, journals, books, websites, reports, etc

## **V. INDIA'S SMART CITY PROJECT**

India is witnessing a rapid pace of urbanization, which is expected to continue in the coming decades. According to recent studies, by 2030: 40% of India's population will be living in ur 68 cities will have a population of more

than 70% of net new employment will be generated in. It is estimated that, on average, about 75% of the global economic production takes place in cities, and Indian urban areas will also follow the trend an

By 2020, housing shortage will reach about 30 million dwelling units, 200 million new water connections will be required, 250 million people will have to be given access to sewage, 160 GW of power generating capacity will have to be added and the number of vehicles on our urban roads will increase by 5 times.

Utilizing Smart Cities experience and technology accessible around the world, India can drive the much-needed transformation to a nation of Smart Cities. This ought to be continued along two streams: The first includes : modernization and overhaul of existing cities, where the focus will be on developing and implementing practical solutions that can work ideally with legacy systems and infrastructure. The other stream will include the creation of new Smart Cities from the ground up by leveraging international best practices.

In each case –as evident globally –along with requisite investment in all aspects of urban infrastructure, investment will be required in adapting ICT-enabled management systems and data-driven analytic and decision making in urban planning and operations.

Smart Cities require a holistic approach focusing all three pillars of a Smart City namely Infrastructure, Operations and People. For India, Smart Cities are the need of the hour to achieve significant progress and create a thought leadership position in the global economy.

Urbanization and economic development are two sides of population was urbanized. By 1900 this had ascended to 13%; in 2000 the figure had come to 47%; and in 2008 it passed 50%. On current patterns it is estimated to be 60% in 2030; 70% or even 75% in 2050.

### **Government Should Focus On Following Key Areas For Developing Smart Cities In The Country**

#### **1. High quality streets and public spaces**

Well-planned streets and public spaces that shape the urbanstructure help support local economy, connectivity, culture, creativity, and future developments. A decent road system functions well for vehicles and public transport as well as for pedestrians and cyclists; at least half of the land to be used for public space; 30% to be allocated to streets for building well connected grids and 20% to squares, parks and open spaces.

#### **2. Mixed Urban Uses and limited land-use specialization**

Mixed land-use planning helps createemployment opportunities in local areas, promote the local economy, reduce car dependency and commute, encourage pedestrian, cyclist and other non-motorized transport , reduce landscape fragmentation and green-house gas emissions, provide closer public services, support mixed communities and local economies, promote safer communities and create attractive neighborhoods.

#### **3. Connectivity**

The purpose behind expanding connectivity is to create access to jobs and services forall and to boost local economies. This encourages walking, public transport, and ICT-accessibility.

#### **4. Waste management**

Waste collection modeling and consistent supply to energy generation.

#### **5. Mixed social structure**

This principle aims to promote cohesion and interaction between differentsocial classes in the same neighborhood and ensuring accessibility to equitable urban opportunities by providing different types of housing.

#### **6. Urban resilience**

Resilience requires policies, disaster preparedness strategies, frameworks, plans anddesigns that promote both, the adaptation to climate change and mitigation of GHG emissions.

### 7. Energy and Resource Efficiency

This requires managing growth addressing consumption and resource exhaustion, through strategic planning, policies and measures concentrated on buildings, appliances, and transport and agricultural, industrial and services industries. By utilizing resources in a sustainable manner, assisted by smart technologies cities can minimize impacts on the environment and be responsive to the needs of the poor and vulnerable.

### 8. Smart grids or energy networks

Demand management, electronic vehicle support, energy efficiency program, and renewable energy integration;

### 9. Practical and enforceable norms and rules

To adapt up with the fast urban growth that cities are experiencing, it is critical to provide policies, plans, norms and rules that respond to the current needs of municipalities. The guidelines, norms and rules should be developed with a participatory approach based on the principles of equity and social cohesion.

### Challenges for Smart Cities in India

The Smart Cities Mission still has its own challenges to face.

- **Retrofitting existing legacy city infrastructure to make it smart:** There are various latent issues to consider when reviewing a smart city strategy. The most essential is to determine the existing city's weak areas that need-per-cent distribution utmost of water consider a supply and sanitation. The integration of formerly isolated legacy systems to achieve citywide efficiencies can be a significant challenge.
- **Financing smart cities:** The High Power Expert Committee (HPEC) on Investment Estimates in Urban Infrastructure has assessed a per-capita investment cost (PCIC) of Rs 43,386 for a 20-year period. Using an average figure of 1 million people in each of the 100 smart cities, the total estimate of investment requirements for the smart city comes to Rs 7 lakh crore over 20 years (with an annual escalation of 10 per cent from 2009-20 to 2014-15). This translates into an annual requirement of Rs 35,000 crore. It is very important to see how these projects will be financed as the majority of project need would move through complete private investment or through PPPs (public-private partnership).
- **Three-tier governance:** Successful implementation of smart city solutions needs effective horizontal and vertical coordination between various different institutions giving various different municipal amenities as well as effective coordination between central government (MoUD), state government and local government agencies on various issues identified with financing and sharing of best practices and service delivery processes.
- **Providing clearances in a timely manner: It may be a significant challenge as everyone knows the level of corruption in our country.** For timely completion of the project, all clearances should use online processes and be cleared in a time-bound manner. A regulatory body should be set up for all utility services so that a level playing field is made available to the private sector and tariffs are set in a manner that balances financial sustainability with quality.
- **Availability of master plan or city development plan:** In our country most of the cities have master plans or a city development plan, which is the key to smart city planning and implementation and encapsulates all a city needs to improve and provide better opportunities to its citizens.
- **Technical constraints of ULBs:** Most ULBs have limited technical capacity to ensure timely and cost-effective implementation and subsequent operations and maintenance owing to limited recruitment over a number of years along with inability of the ULBs to attract best of talent at market competitive compensation rates.
- **Capacity building programme:** Building capacity for 100 smart cities is not an easy task and most ambitious projects are delayed owing to lack and absence of quality manpower, both at the center and state levels. In terms of funds, only around 5 per cent of the central allocation may be allocated for capacity building programs that focus on training, contextual research, knowledge exchange and a rich database.
- **Reliability of utility services:** For any smart city in the world, the focus is on reliability of utility services, whether it is power, water, telephone or broadband services. Smart cities should have universal access to

electricity 24×7; this is not possible with the country's existing supply and distribution system. Cities need to shift towards renewable sources and concentrate on green buildings and green transport to reduce the need for electricity.

**Greater Warangal:** The cultural capital of Telangana - A case study for becoming a smart city: Warangal is in the list of 100 cities which are under the Smart City Project of Government of India.

***Profile of “The cultural capital of Telangana – Greater Warangal”:***

Warangal is a city and district headquarters of Warangal and Districts in the Indian state of Telangana. Warangal is the second largest city in Telangana after Hyderabad.

Greater Warangal is spreading across 406.87 km<sup>2</sup> (157 sq mi) with a population of 8,11,844 (2011 census)). Along with 11 other cities in the country having rich culture and heritage, it has been chosen for the **HRIDAY** – Heritage City Development and Augmentation Yojana scheme by the Government of India.

Warangal served as the capital of the Kakatiya dynasty which was established in 1163. The monuments left by the Kakatiyas include fortresses, lakes, temples, and stone gateways helped the city to become a significant tourist attraction. The Kakatiya Kala Thoranam was included in the Emblem of Telangana by the state government. The city along with its two neighborhoods of Hanamkonda and Kazipet, is often referred as 'Tri City'. During Kakatiyan rule, the city was referred with various names like Orugallu, Ekasila Nagaram, or Omatikonda all these means a 'single stone' referring to a huge granite boulder present in the Warangal fort.[9] When the kakatiyan dynasty was defeated by Delhi Sultanate in 1323, ruler Juna khan conquered the city and renamed it as Sultanpur.

Warangal is located at 18.0°N 79.58°E. It has an average elevation of 302 metres (990 feet). It is settled in the eastern part of Deccan Plateau made up of granite rocks and hill formations[14] which left the region barren making the cultivation depend on seasonal rainfalls. There are no river flows nearby Warangal, which makes it to rely on Kakatiya Canal which originates from Sriram Sagar Project to meet the drinking water requirements.[15][16] Located in the semi-arid region of Telangana, Warangal has a predominantly hot and dry climate. Summer starts in March, and peak in May with average high temperatures in the 42 °C (108 °F) range. The monsoon arrives in June and lasts until September with about 550 mm (22 in) of precipitation. A dry, mild winter starts in October and lasts until early February, when there is little humidity and average temperatures in the 22–23 °C (72–73 °F) range. Many hill rocks and lakes are located around Warangal. Padmakshi hill and Govinda Rajula Gutta are two famous hills with temples.

Bhadrakali Lake, Dharmasagar lake and Waddepally Lake are the three famous lakes which adds scenic beauty and also are the major sources of drinking water.



## SWOT Analysis – Greater Warangal City

### Strengths

#### 1. Historical and cultural significance

Warangal has great historic past. It was the capital of Kakatiya Dynasty. This preponderance of mythology reinforced by strong religious traditions manifests itself in a number of regional festivals (Bathukamma festival, Sammakka-Saralamma Jatara, etc) and temples. Many historical and tourism spots are located in the vicinity of the City. Statistics (Telangana Tourism Department, 2015) reveal that nearly 2.3 crore tourists visit annually Warangal District. The city was awarded as the best heritage city by Govt. of India during 2013-14. It is also known as the cultural capital of Telangana.

#### 2. Presence of regional educational institutions and skilled human resources

City has been serving as an educational center/ hub for its entire region. The key national and state level educational institutions located in the city are NIT, Kakatiya University, Kakatiya Medical College, Kakatiya Institute of Technology and Science (KITS) etc. Nearly 30,000 students are studying in these institutions.

#### 3. Strategic transportation connectivity

Warangal is well connected with State capital and other places of the State and Country. NH-163 and SH-7 traverse through the City. It is the second largest City in the state and with best railway connectivity (Kazipet Junction) in the state, outside of Hyderabad it provides an important opportunity to attract investment in employment creating activity, which is important in creating a strong growth node outside of Hyderabad. Railway junction at Kazipet is always known as entry to North India. Besides, city is connected with International airport at Shamshabad, Hyderabad at 170 km.

#### 4. Serving as regional trade center and agriculture base

Warangal is acting as hub of local trade and commercial activity for the region. Warangal is one of the key producers of long-staple cotton among Telangana districts. Enumamula market, Asia's biggest cotton market is located in the City. Nearly 100,000 people commute daily to Warangal City.

#### 5. Water Resources-

Warangal city has a number of lakes, meeting needs of drinking water and irrigation. Major lakes include Dharmasagar, Waddepally and Bhadrakali. Total capacity of these lakes is around 1080 MCFT.

**Weaknesses****1. Lack of strong industrial base economy**

Currently city is majorly depending on agriculture and service sectors. Majority (54.3%) of the workers in the recently added 43 villages with GWMC jurisdiction depend on agricultural sector. Cotton is the major cash crop and paddy is the major food crop in the region. Chilly cultivation is also wide spread in the area. The region intensely depends on secondary rainfalls and the farmers often have poor harvest due to insufficient or lack of rainfall. Some industries like Azam Jahi Cloth Mills, which existed during the Nizam's rule, were closed down. There are many small scale industrial units like rice mills, oil mills, cotton ginning mills, beedi making factory, dairy product, granite slab polishing. Consultation reveals that many cotton mills and rice mills with outdated technologies are running in great loss. There are no major economic opportunities for the people.

**2. Inadequate provision of core urban services**

The city faces a number of infrastructure deficiencies, primarily in the areas of water supply, solid waste management, sewerage and drainage. Not only does this impact the quality of life of residents, but also poses a significant threat to the fragile environmental and ecological balance in the city. With respect to water supply, at present only 58.82% of the households are covered with water supply at the rate of 80 LPCD and as low as 4.4% of the system is metered. NRW accounts for as high as 40%. The city does not have underground drainage and sewerage system. Most of the Households (93%) have individual septic tanks disposal, connected to nearby open drains. Further, septage management is not organized properly. With respect to road side drains, out of total of 2700 km of roads, only 37% have pucca drains. Currently, only 10% of the roads have pedestrian foot paths. City roads are designed mainly for automobile. The capacity of carriageway of major streets has reduced substantially due to on-street parking, informal mobile vendors, thereby reducing the actual capacity of roads significantly. Due to lack or inadequate pedestrian side-walks along many roads, walking is difficult and often dangerous.

**3. Presence of significantly large slum population**

The city has a total of 183 slums, of which, 92 are notified (1.68 lakhs population) and the remaining are non-notified (1.5 lakhs population). With a population of nearly 3.21 lakhs, slum population of the city accounts for nearly 42% of the total population.

**4. Poor tourism infrastructure**

Although the city has an excellent tourism potential, it appears to be largely untapped due to inadequate tourism infrastructure, in terms of information centers, hotels meeting requirements of all income groups, guided tours, interpretation centers and so forth.

**VI. OPPORTUNITIES****1. Potential tourism opportunities**

Warangal has always been a magnet not just for regional and national tourists but also for international tourists who flock to the city throughout the year to discover ancient heritage of the region. The city is therefore in a unique position to leverage these well entrenched attributes in order to showcase itself as a front-runner among tourist destinations in the State. The Government of India recognized Warangal as a 'Heritage City' considering its historical importance in the context of Kakatiya dynasty. The city has an excellent tourism potential, some of the major tourist sites within the city include Warangal Fort, Thousand Pillar Temple, Bhadrakali Temple, Kush Mahal, Jain Temple, Kazipet Dargah, Padmakshi Temple Siddeshwara Temple, Sri Veeranarayana Temple, Mettugutta, Vana Vignana Kendra, Musical Gardens, Museum, Planetarium, Waddepally Tank, Sanskrit Vihar and Fatima Church. Provision of adequate infrastructure will help tapping such tourism potential and thereby diversifying city economic base.

**2. Economic development opportunities**

Being the 2nd largest city next to Hyderabad in Telangana, Warangal, with its strong skilled resource availability, strong transport linkage huge potential of tourism and heritage base, has a tremendous potential to become economically vibrant city in Telangana. Government of Telangana has proposed to develop a mega textile park in

the City. Due to the presence of major institutions and proximity to Hyderabad Warangal is having opportunity to develop knowledge base industries.

### **3. Potential to become sub-regional industrial and logistics hub**

The city having good connectivity with rail, has an opportunity to be developed as a logistic hub, leveraging its proximity to Hyderabad. Comprehensive Transportation Study for Hyderabad Metropolitan Area has also proposed connecting a “high-speed rail corridor between Hyderabad and Warangal” on a medium to long term policy.

### **4. Potential to tap water-resources**

The city has several lakes and ponds, currently without water, would help increasing water table and sources of water supply and irrigation, if tapped strategically for rain water harvesting.

### **5. Presence of sizable Government Institutions and Educational Campuses**

City at present has sizable quantity of area occupied by government offices and educational institutions, which can be tapped for generation of solar power and rain-water harvest.

## **VII. THREATS**

Warangal has been witness to continuing environmental degradation of natural resources with a visible effect especially on the water bodies in recent times. In addition, the pressures of playing host to a large number of tourists and visitors in normal course and also during the regional festivals have also added to the challenge of preserving the local environment.

### **Agreed Vision and Goals**

Warangal aspires to be the cultural capital of Telangana and will continue to be the center of heritage and cultural tourism, which Telangana people proudly identify.

The vision for the city would therefore be: "to transform Warangal into a vibrant regional economic hub in Telangana and to make it a clean, green, inclusive, modern, safe and citizen friendly and well governed city".

The vision statement is highly related to the city profile and unique challenges and opportunities present in the Warangal city, as it is imperative from the following:

(a) The city has grown up as a center for local trade and government, however, the aspirations of both Government and Citizens in newly formed Telangana State, is to energies most of its second and third tiers of cities into new engines of growth, apart from envisaging Hyderabad city towards a Global City. Therefore, vision statement for Warangal city incorporates such thought process and envisages diversifying its economy.

(b) As the second largest City in the state, Warangal exhibits a relative advantage of having strong road, rail connectivity with Hyderabad city, apart from using its International Airport as enablers for attracting new investments and entrepreneurs outside Hyderabad. Government of Telangana envisages developing Warangal as a potential industrial node leveraging its current industrial areas along Warangal-Hyderabad highway (NH-163) and other areas. A proposal is underway to set up a Textile park taking cue from already existing power looms and textile based industries within the city.

(c) With advantage of once being the capital of Kakatiya Dynasty, the city had an advantage of building a number of heritage assets since 12th Century. These have become the tourism attractions with time. They exhibit significant opportunity to attract additional tourists, provided such tourism resources are enhanced and made more attractive to tourists. Enhancing and boosting tourism based economy of Warangal will be one of the routes to diversifying its economy. Providing tourism support infrastructure facilitating tourists within the city will support this idea.

(d) An overview of the strategy for Warangal is to build on its historic strengths so that it has a strong economy that continues to support growth in a population that is fully employed and enjoys a good quality of life.



(e) Given the above mentioned economic development/diversification agenda, the unique challenge lies with the GWMC is improving its core urban services to all and making a more attractive and livable city. Improving its core urban services and developing a clean, green and sustainable environment within the city will therefore form one of the basic requisite for attracting more entrepreneurs and tourists. They would not only help improving quality of life of citizens, but also, help attracting new investments in a foreseeable future.

**The overall aspirations and goals for the city are hence as follows**

**Goal 1:** Provision of core urban services to all - City at present is faced with either an inadequate coverage or supply of core urban services by the GWMC. Further, even were the services are partially provided, the system availability suffers from obsolescence and needs replacement. Besides, the results of citizen engagement process suggest that citizens aspire to have access to 100% coverage of all such core urban services with a modern and intelligently managed system, particularly with respect to water supply, sewerage coverage and connections, solid waste management with segregation at source, and drainage to achieve clean environment in the city. Therefore, the city will address the issue on provision of core urban services to all citizens during the next five years. It shall include (a) adequate water supply with 150 LPCD, replacement of old water pipes to arrest leakages and reduce NRW, smart metering to monitor bulk supply and individual consumption, an efficient SCADA system to monitor water supply system; (b) adequate sanitation and waste water management including sewerage connection to all properties, sewage treatment system up to minimum of secondary treatment and re-use of treated water (c) adequate waste management including cent percent coverage of solid waste management system with door to door collection, segregation at source, transportation system and treatment system; and (d) underground drainage system.

**Goal 2:** Ensuring inclusiveness through Slum Area Improvement – One of the ingredients of a city's success is its ability to take along all sections of society. City like Warangal will continue to receive migrants and hence urban poverty must be considered as a dynamic problem and city should address their issues in an integrated manner. As the city has nearly 42% of the population living in slums, providing adequate basic urban services, in-situ development, housing for poor and slum population must form focus of GWMC. Citizens during consultation process emphasized on improving the slum areas through provision of basic infrastructure and opportunity for skill development.

**Goal 3:** Ensure efficient urban mobility – Warangal at present lack efficient public transportation system and share of personalized mode of transport and IPT is increasing many folds. Therefore, improving an efficient public transportation system would ensure achieving sustainable urban mobility in Warangal. It will include improvement of bus based public transport, organized smart parking provision, and traffic management through use of ITS

**Goal 4:** Improve efficiency of NH 163, transportation life line of Warangal Tri city – Warangal comprises three sub cities viz., Kazipet, Hanamkonda and Warangal and NH 163 is traversing through all three of them. Due to presence of majority of employment areas, recreational area, shopping, educational and health institutions within these sub-cities are along the NH 163, currently the corridor is servicing nearly 80% of the infra city and inter-city traffic (to Hyderabad) of the city. The corridor, though wide enough, faced with several inadequacies including proper geometry, land marking, foot path, underground utilities, bus-bays, parking areas, poor geometry at intersections, signals, pedestrian crossing, too many median opening, improper treatment at radial road connections and so forth. Improving the NH-163 will help achieving efficiency in transportation system within Warangal city.

**Goal 5:** Improving walkability and NMT – They are few of the key principles of any resilient city and ensuring healthy quality of life of any city. At present, the city has only 10% of the roads have proper side walks. Therefore, GWMC should focus on road network friendly to pedestrians and cyclists, which would enable community for quality living, working and play.

**Goal 6:** Protection of its natural environment and lakes - Warangal city contains a number of natural areas in the form of hills/hillocks and lakes. These elements are very important part of the perceived image of the city. Citizens have emphasized on protecting these areas and keeping lakes clean from waste water entering them. These natural

areas are also important part of the cultural, historic, and public space of the city. Keeping these areas free from environmental pollution, encroachment, and need better integration with the city to help keep the place green and clean. Warangal is one of the cities chosen under HRIDAY.

**Goal 7:** Development of diversified economic base – Leveraging on proximity and strong road and rail connectivity with Hyderabad, the capital city, its potential tourism and heritage assets within and around Warangal, agriculture resources, skilled resources, the focus of the city in next 5-10 years should be to diversify its economic base in to value-added industrial base, tourism base activities.

**Goal 8:** Use of smart solutions - Citizens during consultation process emphasized use of number smart solutions in urban services delivery and management of the same in more efficient manner by the GWMC. Therefore, GWMC will ensure that most smart solutions shall be deployed for efficient management of city infrastructure and provide related public grievance addresses system through use of e-governance.

**Goal 9:** Use of alternative energy sources and energy efficiency: One of the efforts that city government shall work for is making green city. Use alternative sources of energy through use of solar power and provide smart energy utilization monitoring mechanism to reduce power and revenue losses.

**Goal 10:** Development of Heritage and Tourism Infrastructure: Warangal is bestowed with number of heritage assets, which attract tourists from across the state and country. Providing tourism support infrastructure will help to leverage tourism potential of the city and region.

### **Challenges for Greater Warangal in becoming the Smart City:**

#### **1. Health care**

Warangal City has been acting as Regional center for providing health facilities. The city has 21 hospitals, 14 UHCs and 22 public health centers. Mahatma Gandhi Memorial (MGM) Hospital is the biggest among all, has bed strength of 1,000. Over 2,500 outpatients are treated daily in MGM Hospital. Apart from major public hospitals such as those for maternity, chest and tuberculosis, there are many private specialist hospitals including Lifeline, Rohini, Jaya, Guardian, Max Care, and St. Ann's. But it lacks even basic infrastructure and manpower requirements for the city's residing for nearly 8 lakh residents.

#### **2. Education**

The city provides very limited educational facilities for its residents. There are some schools but very limited compared to the demand. Many schools are in poor condition. At present, the city has over 95 primary educational facilities and 32 High schools.

The city has a number of educational institutions of all types. City is known for its nationally renowned higher order educational institutions with the presence of Kakatiya University and Kaloji Narayana Rao University of Health Sciences are two universities in the city. Other notable educational institutions include NIT Warangal, Kakatiya Institute of Technology and Science, Vaagdevi College of Engineering, SR Engineering College, and Kakatiya Medical College and so many colleges. Besides, there exists adequate number of schools and colleges serving the secondary educational needs of the Warangal and beyond. Unable to meet the requirement of education, it needs more colleges.

#### **3. Solid Waste Management**

- Greater Warangal spends crores on purchase of garbage-lifting vehicles and bins, but has failed to put in place the process for collection and segregation of garbage at household level. So, garbage which can be recycled is being dumped at open spaces
- Bio-medical waste management is also not effective in city.
- GWMC Solid waste generation is about 260 MT per day. Waste is segregated at source. GWMC collects waste at door to door level through pushcarts and transferred to dumper bins/ compactor bins daily. Garbage is transported through compactors /dumper placers to dumping yard at Madikonda. SWM covers

76.15% of the population. In some sectors, it empties bins once in three days, once a week and even once in 15 days.

#### 4. Regulating Traffic

Greater Warangal, regulating the traffic is a big challenge, because of the number of registered vehicles — 1.88 lakh.

#### 5. Transport Service

GWMC offers only 10% of the roads have pedestrian foot paths. Comprehensive Transportation Plan (2008) reveals that only 11-12% of the trips are performed using public transport system and another 30% uses NMT as mode of transport. Average journey speed within the city has been reducing from 25-30 kmph during 2005 to 20 kmph at present

### VIII. CONCLUSION

In India, administration in the cities are often confronted with a multitude of key problems, like unplanned development, informal real estate markets, inevitable population growth, lack of infrastructure, inadequate transport facilities, traffic congestion, poor power supply, in competent health services, and lack of basic services both within the city and in the suburban areas, poor natural hazards management in overpopulated areas, crime, water, soil and air pollution leading to environmental degradation, climate change and poor governance arrangements are leading the urban citizen life in unhappy. So it is the need of the hour to plan and build the smart cities in view of resolving these problems.

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