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Development of Jhansi as a Smart City

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ABSTRACT: Smart city is defined as the effective integration of physical, digital and human systems in the built environment to deliver a sustainable, prosperous and inclusive future for its citizens [1]. The concept of smart city varies from city to city and country to country, depending on level of development, willingness to change and reform. In India, the definitional boundaries aim at developing the entire urban ecosystem that includes four pillars of comprehensive development- physical, institutional, social and economic infrastructure.

KEYWORDS: Smart city, Sustainable City, Existing city into smart city, City Indicators, Indian Smart Cities, Future of Indian Cities, Unplanned city into a Smart City, Green City, Modern Cities of India, Sustainable development.

I. INTRODUCTION

The planning, design and construction of existing or future cities requires an integrated approach of living city with environment and natural resources, urban development and infrastructure, society and community, governance and growth. This paper provides various proposal and recommendations for the development of Jhansi as a Smart City. Jhansi city is already an educational, medical and cultural hub of whole Bundelkhand region. Various people migrate to Jhansi city in search of job, education or for better health conditions or treatment. This is causing a pressure on development of Jhansi city to cope up with this increasing unplanned settlement creating an extra burden on available resources. The profile of Jhansi city is also generated based on the characteristics like demographic profile, climatic profile, economic profile, infrastructure status, political profile, finance & health and environmental profile.

The major problems of Jhansi city have been identified and studied properly. The main problems of Jhansi city that drags the city away from its development are unplanned settlement, unemployment, coal based energy generation, inability to use huge potential solar energy, improper maintenance of parks, slums and houses for poor, intra-city public bus transport and acute water shortage.

The comprehensive solutions are provided to every major problem addressing benefits from the respective solution. Various standard city indicators were identified and selection. Information was collected from various sources to calculate present status of city indicators. After collection of information the city indicators are properly calculated. Based on assessment of these indicators, the components that require work are indicated and determined.

II. RELATED WORK

According to Jain, A.K (Architect, Town Planner, Planning Commissioner in DDA), the fast and unexpected rise of cities have caused urban problems and India now struggles with the conditions of today's existing cities. Thus the author has shown the importance of adopting an integrated approach towards ecology and conservation of natural resources as a basis of city planning and development. A balance between citizen demand and freedom versus environmental sustainability is maintained.[2]

Dubey.S.K et al (2017); emphasized on the sustainability dimensions and indicators for smart city and its application to examine the participation and role of government for various development activities for smart city and helps in

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formation of policy and development plans considering the future scenarios. Smart city can be achieved by connecting the different dimensions and different indicators and make them operational with key participation of the society.[3]

Giffinger, Dr R et al (2007); have prepared city-ranking of European medium sized cities based on their perspectives of development because medium sized cities have to cope with competition of larger metropolitan cities, although medium sized cities are less well equipped in terms of critical mass, resources and organizing capacity. City-rankings are a helpful instrument to improve the competitiveness of medium-sized cities and evaluating economic, social and environmental conditions in different cities showing their strengths and weaknesses.[4]

Yigitcanlar, T. et al (2015); have highlighted the need of sustainable urban development. Cities and human activities have affected our ecosystems, thus the sustainable planning, development and management of cities must be prioritised.[5]

Llacuna, M. et al (2014); have presented a reformed Smart Urban Planning method over traditional planning method to be used for designing and establishing the distribution and use of urban land by considering the public participation and opinions.[6]

III. PROPOSED METHODOLOGY

3.1 SMART CITY STANDARDIZATION CODES

The following Smart-City Standard codes were referred for evaluating the city and to identify sectors for the scope of development of Jhansi in a Smart city:

1. IS – Smart Cities – Indian Standard City Indicators Draft:
The standard code for indicators of Smart city for India is drafted by Bureau of Indian Standards (BIS), However it is still under process.
2. ISO 37120:2014 Sustainable Development of communities - Indicator for City Services & Quality of Life:
ISO 37120 establishes explanations and approaches for a set of city indicators to direct and measure distribution of city services and quality of life. It is the latest series of International Standards being developed for a universal and integrated approach to sustainable development; this set of standardized indicators provides a uniform approach to what is measured, and how that measurement is to be undertaken.
3. URDPFI Guidelines Vol. I & II 2015 - Town & Country Planning Org, Ministry of Urban Development:
The URDPFI (Urban & Regional Development Plan Formulation & Implementation) guidelines are the set of guidelines for the development of urban and regional areas including its plan formulation and also implementation. These Guidelines are published by Town & Country Planning Organisation under Ministry of Urban Development.

3.2 METHODOLOGY

The methodology used for the study is given step-wise as follows:

1. Identification of Required Standard City Indicators based on IS-Smart Cities Draft derived from ISO 37120:2014:
The required city indicators are identified which are based on Indian Standard smart city indicators draft based on ISO 37120:2014 - Sustainable Development of communities - Indicator for City Services & Quality of Life.
These indicators are of two types:-
 - a) Core Indicators
 - b) Supporting indicators

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Core indicators are the essential indicators required for steering and assessing the performance management of city services and quality of life. Supporting indicators include additional indicators that may affect the city services and quality of life.

2. Data Collection of Information Required for Assessing City Indicators:

To assess the City Indicators, relevant data is collected directly from various online sources, state and district level organisations such as Census 2011, Municipal Authority- Jhansi Nagar Nigam (JNN), Unified-District Information System of Education Program (U-DISE) under MHRD, UP Pollution Control Board (UP PCB), Jhansi Fire Department, Jhansi Development Authority (JDA), UP National Health Rural Mission (UPNHRM), Regional Transport Office (RTO), Public Works Department (PWD), Jhansi Planning Department- Economics And Statistics Division (DES), Jhansi Police-District Crime Report Bureau (DCRB) or processed using information from these sources to calculate City Indicators.

3. Reviewing Present Status of City Indicators:

After collecting data from various sources, City indicators – Core Indicators and Supporting Indicators must be calculated using the gathered information. However, it is very challenging to gather all the information required for assessing City Indicators.

4. Proposed Strategy for Area of City by Retrofitting, Redevelopment, Greenfield and Pan-City Development:

Based on the present status of City Indicators, Jhansi can be developed into a smart city by city improvement, city renewal and city extension:-

- a) City Improvement: The method of correcting the insufficiencies in a known area through essential intrusions is known as retrofitting.
- b) City Renewal: The reconstruction of already constructed area that is not responsive for any interventions is known as redevelopment.
- c) City Extension: The development of previously vacant area for poor or evenly planned expanding of population is known as greenfield development.

5. Map Preparation on ArcMAP 10.5 based on Status of Jhansi City indicators and Proposed development:

Now Maps of Jhansi are prepared from the satellite image of Jhansi city taken from Google earth Pro on a Software ArcMAP 10.5. The satellite image of Jhansi is geo-referenced prior to further processing of image. The maps are prepared highlighting the deficiencies and indicating the present status of City indicators on Jhansi Map.

6. Components Proposed for Development of Smart City Jhansi:

Finally, Components are proposed for the development of Smart City Jhansi by analysing and solving problems identified during assessment of City Indicators.

Applying these steps, we will be finally able to provide recommendations for development of Jhansi as a Smart City.

3.3 SOFTWARES USED:

The softwares used in paper work are as follows:

1. ESRI ArcGIS ArcMAP 10.5:

ArcMAP 10.5 is used to study and analyse satellite image of Jhansi City. This software is also used for preparation of Maps of Jhansi City.

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2. Google Earth Pro:

Google Earth Pro is used to download High definition satellite image of Jhansi City. This image was geo-referenced in GIS software ArcMAP and was further processed.

3. AutoCAD 2017:

AutoCAD 2017 is used to prepare plans of Low cost houses and buildings that are used for Slum eradication and providing shelter facilities to the poor and economically weaker sections.

IV. EXPERIMENTAL RESULTS

The development of Jhansi city into a Smart city will provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and with application of ‘Smart’ Solutions. More emphasize is laid on sustainable and inclusive development and while considering the compact areas and improperly unplanned areas. It is done by effective smart planning and implementation, smart energy management, smart water solution and waste minimization, smart IT, Communication and integration and sustainable construction.

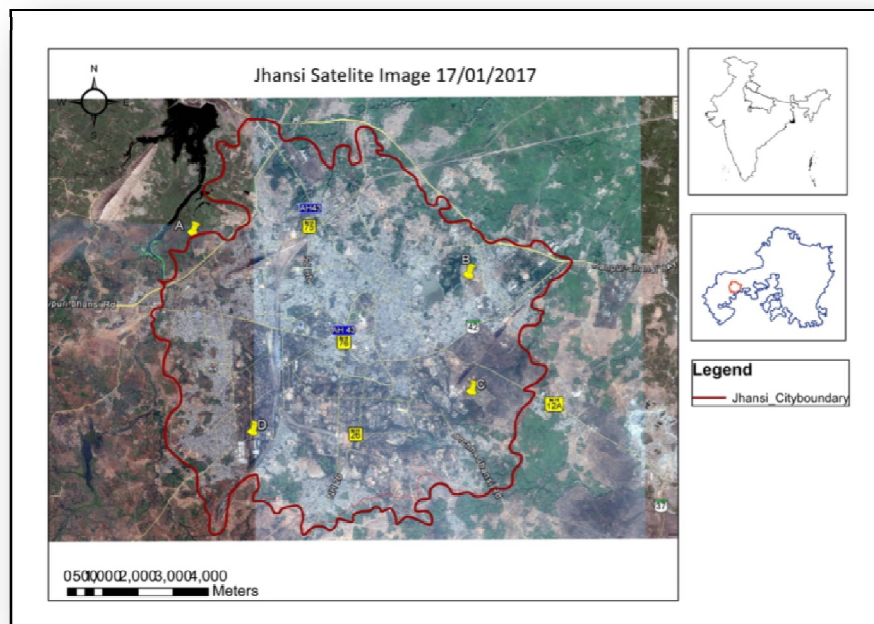


Fig. 1 Map prepared using Satellite Image of Jhansi City, The satellite image was taken from Google Earth Pro and was further analyzed on ArcMap (a GIS software of ESRI) and finally map of Jhansi city is prepared.

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Fig. 2 Shows map preparation of Jhansi City using ESRI's GIS software ArcMAP 10.5.

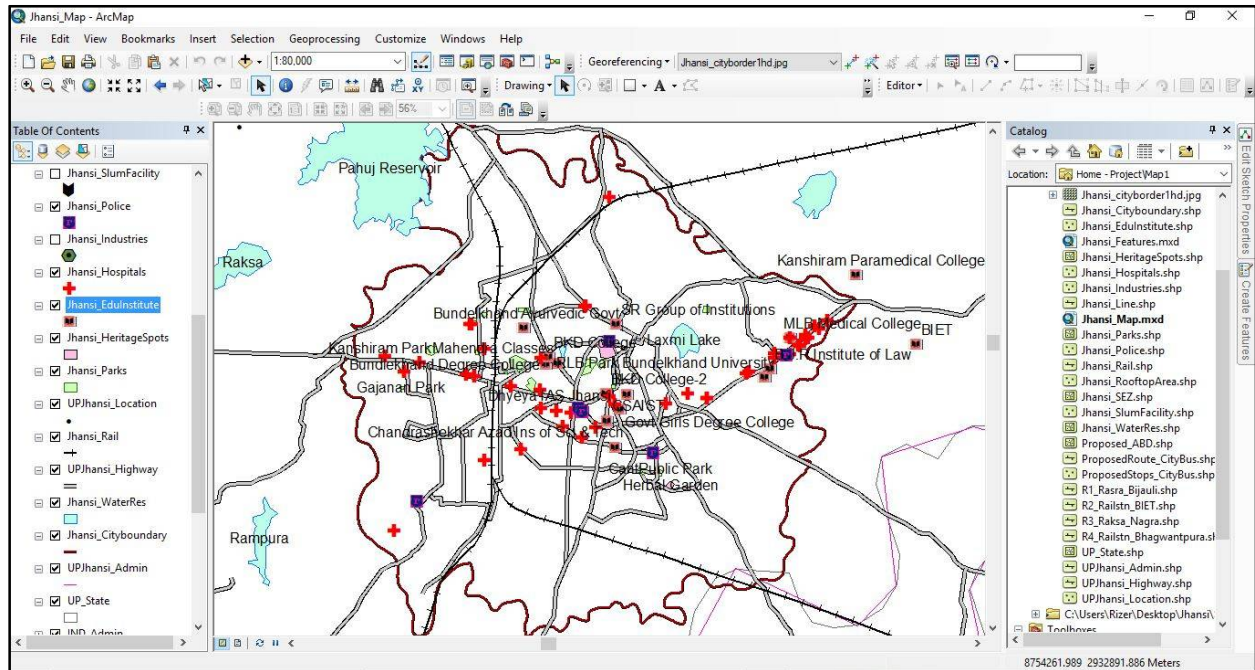


Fig. 2 Preparation of Map of Jhansi City using ESRI's GIS software ArcMAP 10.5

V. CONCLUSION

This paper provides various proposal and recommendations for the development of Jhansi as a Smart City. The major problems of Jhansi city have been identified and studied properly. The main problems of Jhansi city that drags the city away from its development are:

- i) Unplanned settlement
- ii) Unemployment,
- iii) Coal based energy generation
- iv) Inability to use huge potential of solar energy,
- v) Improper maintenance of parks
- vi) Slums and houses for poor
- vii) Intra-city public bus transport
- viii) Acute water shortage.

The comprehensive solutions are provided to every major problem addressing benefits from the respective solution. Based on this assessment of city indicators, strategy for development of area of Jhansi City by Methods of Retrofitting, Redevelopment, Greenfield and Pan- City Development are proposed and the components requiring solutions are identified.

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The solutions for the different components to pave the way for Jhansi to be a Smart city are:

- i) Proposal for Special Economic Zone as per Potential Industries.
- ii) Solar Power Plant on Pahuj River in Jhansi City.
- iii) Green Belt and Green Zones for Jhansi as Green City.
- iv) Solar Equipment installation on Building, Sheds and Parks and Playground.
- v) Housing for Poor and Slum People.
- vi) Intra-City Public Bus Transport Service.
- vii) Proposal for Jhansi Airport at Rasra, Jhansi.
- viii) Population projection for Next 30 years.
- ix) Infrastructure demands for Next 30 years.
- x) Potentials for Rainwater harvesting from Roof top area of Buildings.

The softwares used in this paper are: ESRI ArcGIS ArcMAP 10.5 and AutoCAD 2017. ArcMap 10.5 is used to prepare maps supporting each components of smart city with representation and its location and also for representation of solutions to problem. The maps prepared are of Existing Industries, Proposed SEZ, Educational Institution, Roof top area of Buildings, Parks, Hospitals, Tourists Spots, Police Stations, Slum Facilities, Major roads and rails, Proposed Bus Routes and Bus Stops and Water resources of Jhansi City. This software also helps to generate attribute table of required information.

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