Smart Villages, Information Communication Technology and Geographical Information System

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Abstract:
Prime minister has presented his dream of smart cities in India and a bunch of hundred cities has been selected for the project. These cities are supposed to work with an efficient technology based sustainable model of development. Mahatma Gandhi always anemphasis on the development of rural India and his statement “India lives in its villages” was his visionary idea. An area that is located outside the cities and towns (countryside in western literature) is known as rural. In India, there are near about 70% of the population residing in rural areas and those areas need immediate face-lifting in term of socio-economic and political spheres. Lower educational attainment and poor economic conditions keep them backward than urban counterparts. Wisely and combined uses of information communication technology (ICT) and Geographic Information System (GIS) can enhance rural areas from agriculture to industries and farm to housing, from education to health and other spheres of rural life. The present paper is an attempt to explore the areas of rural life those can be improved with the help of ICT and GIS techniques.

Key Words: Village, Urban, information communication technology, Geographic Information System, Public Participation, Planning, Agriculture, small scale industries, Weather, Education, Health, PURA

Introduction:
Government of India initiates the dream project of making cities smart. The government wants to bring cities sustainable, safer, easy and well facilitated for their citizens. Human civilization on earth surface has witnessed various changes in human life style to settlement systems. We have seen the development through different catalysts like agricultural, industrial development, green revolution, science, and technology, etc. Presently Information and Communication Technology supersedes many things and have its edges over all the developments globally. Information & communication technology and geo-technologies (Remote Sensing and Geographical Information System) has proved their potentialities in various spheres of the development in both urban and rural landscapes renovations (Jin Tao 2014). Urban areas are likely to be more beneficial in this field due to their advantages of their influence on socio-economic and political factors. High literacy/education, economic conditions and advantageous availability of infrastructure makes them very first adopters of this technology to develop their habitat in comparison to their rural counterpart. Urban areas are highly accommodated with the new technologies in their personal life to social life and from economic to political activities.

The present research article discusses the technique to persuade the rural development in developing country like India for the up-liftmen of livelihood and lifestyle of the rural masses by combinedpractices of the informationcommunication technology and geo-techniques. The conceptual motivational model behind the concept of “Smart Village” is that the technology should acts as an agent of innovation, change and development for rural masses. Present study look into possibilities where purposed “Smart village” can help in resovlving the all issues by applying the ICT and GIS technologies. In a smart village system, technologies like Computerisation, smart equipment, E-services, E-
marketing, E-Governance, Mobile telephony, Wi-Fi, Smart Broadcasting, E-Weather Services etc. could work as development ecology. Uses of ICT-GIS based services in Weather forecasts, climatic data analysis, and Agro-advisories could change the game for agrarian rural masses at large. Smart accessibility and mobility are rooted in the development nexus; it is the means for progress (Poster 2002). These smart villages may rise as sustainable smart cities in future if planned presently correctly. The “Smart Village” concept aims to realize its goal through providing planners insightful, bottom–up analyses of the capabilities, possibilities, and potentiality of the village with the help of the combined knowledge base of ICT and GIS.

Agriculture is the main source of livelihood in rural areas along with animal husbandry, fishing, cottage industries, and pottery like occupations. According to the Census of India department, a settlement considered as “Village” where most of its population (Not less than 25 percent) engaged in primary activities, the area is not a notified cantonment area nor a notified urban area. In aggregate all the areas which are not categorized as an urban area are considered as rural. The majority of the rural population in India lives in nucleated villages, which is commonly known as the shapeless agglomeration of settlements. Where mostly everything seems looking mismanaged and unplanned from a long time. In a rural country like India, Idea of smart cities in incomplete, impractical and unethical without parallel drawing of smart village projects. In India rural area has accounted population share of 68.84 percent against the urban share 31.16 percent to the total population.

It is well-observed fact that the rural population is suffering more for livelihood earning, sanitation facilities, education, and health services as compared to their counterpart urban areas. The difficulties to achieve livelihood, earning, education, health, and other requirements are forcing the rural population to migrate to the cities and towns. The social science scholars have already recognized this issue at the very earlier stage and now the days governments (Centre and State Governments) are also taking keen interest and has put serious efforts through various schemes for enhancing the livelihood of rural masses. Presently, rural development programs start focusing on the schemes of poverty alleviation, improved livelihood opportunities, reliable provisioning of basic amenities and adequate infrastructure facilities. Population located in arural area also have the same desires and need the same quality of life as enjoyed by urban population. Availability of the enhanced livelihood in arural area may reduce the disturbing effects of poverty, unemployment, and inadequate infrastructure, criminality etc. Hence, the rural area development is directly concerned with the economic growth and social justice. Provision of adequate infrastructure, employment, and quality social services can gear the rural development and it may also stifle migration from rural to urban. Hence, it could diminish the pressure on urban areas and that will ease the approach to bring cities smart.

**Smart Settlements Traces from History:**

Discussion on smart villages does not come in light spontaneously but have the historical development behind the scene. Human civilization has surpassed the various phases of development during the course of time. Some changes are minor and others are colossuses. Human civilization has witnessed to pre-historic to Stone Age and Vedic to Moderns age. The current era of human history on mother earth is quite different from others. It is based on technologies, greatest innovation those bring south and north closer, humanflies to space and voice travel in the atmosphere. Settlements became smart and human beings are using smart phones, smart TVs and live in smart homes.

In India, the concept of the smart village first can be traced in faded form from Harappan settlements where rectangular and crossing streets, proper open sewage system, storage, cleanliness, trade routes are clearly observed and described by scholars from different excavated sites (Vahiya, 2010). In ancient times out villages were enough smart in case of production, governance, judiciary and trade as per different historians views. In his holy speeches and writings, Mahatma Gandhi was of the view that without villages there is no future for India. Neither now nor after independence. Lateral our five year plans were aimed to bring rural areas in mainstream developmental scenario but failed to achieve target always.

**Smart Cities/Smart Villages:**

Recently, scholars have shown their enormous interest in the concept of Smart Cities all over the globe. Making a city "smart" is an embryonic...
strategy to mitigate the problems generated by the urban population growth and rapid urbanization (Chourabi, 2012). “Smart Village” is an exclusively solution oriented initiative that seeks to improve the quality of life in rural areas. Those can be achieved by bringing efficient planning, management, and technological infrastructure installations. Making Cities smarter has huge potentialities to change the urban landscape and the lives of their citizens. The smart city initiative in India has good potential for urban development but could not be achieved without making participation from their counterpart rural areas. These efforts have reduced chances of success till ignorance of 69 percent population of rural India. Rural India where conditions are very different as compared to urban India. A similar model of the smart city cannot be applied. They are different in every aspect of life from cultural to economic and lagged behind in the developmental scenario. It can be traced by some basic statistics given below

**Population:** India’s rural population is 833 million, which is almost 68% of the total population

**Literacy:** 67.8% rural population found literate in 2011 against the 84.1% of urban Population.

**Electricity:** 55% of households in rural areas have electricity, against 93% of urban households

**Piped water:** 35% households have access to piped water connections in rural, versus 71% of urban households.

**Toilets:** 31% of rural households have access to toilets, against 81% of urban households.

**Conceptualisation of the smart village:**

The first conceptual effort in the direction of the smart village in contemporary India was brought in scholars’ discussion table by our esteemed ex. President Dr. A.P.J. Abdul Kalam’s PURA model (Provisioning of Urban Facilities to Rural Areas). He advocates to providing all urban facilities and employment generation schemes for rural masses. The concept of the smart village should be based on local geographic conditions, infrastructural availability, optimum utilization of resource base, efficient and technological improved administration along with potentialities of trade and services to nearby urban areas. Hence the maximum utilization of new ages Information technologies in management and planning of above said traits in rural areas may be used along with geo-technologies to mitigate existing and rising problems. The concept of the smart village should be based on local geographic conditions, infrastructural availability and utilisation of resource base along with potentialities of trade and services to nearby urban areas. Figure 1 represents a conceptual visualisation of a smart village model.
Table 1. Conceptualization of A Smart Village by Smart villages Initiative

<table>
<thead>
<tr>
<th></th>
<th>Social, Skilled and Simple</th>
<th>Zero Tolerance for Caste and Creed or better no caste &amp; creed and no discrimination on Gender and Religion Everyone is literate and skilled Simple living and high thinking</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Moral, Methodical and Modern</td>
<td>Moral values of Gandhi Ji, Swami Vivekananda etc. Methodical using Total Literacy and latest techniques Modern like cities</td>
</tr>
<tr>
<td>A</td>
<td>Aware, Adaptive and Adjusting</td>
<td>Highest level of awareness on global social &amp; economic issues Adaptive and adjusting to fast changing environments</td>
</tr>
<tr>
<td>R</td>
<td>Responsive and Ready</td>
<td>Responsive to collective wisdom, cooperative movement &amp; larger social issues Ready to generate own resources for self-sufficiency and self-reliance</td>
</tr>
<tr>
<td>T</td>
<td>Techno-Savvy and Transparent</td>
<td>Techno-savvy for IT and Mobile usage Transparent in harmonic relations and delivery of services</td>
</tr>
</tbody>
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Rural communities in past historic times were mostly self-reliance and were fulfilling most of their desires from local, surrounded neighboring regions. There was no resilient linkage with foreign, even with far distant regional areas. Rural settlements were acting as a self-independent ecosystem but in many cases, they found dependent on nearby city markets for fulfilling some of their basic need remained due. In the modern age developmental processes, there are many changes in the demand and supply of some of their needs, as rural population is passing through the process of change.

In purposes scheme, a “Smart Village” will follow a model of sustained social, economic, political and environmental approaches for its communities as like as they are available in smart urban areas. Further, it will facilitate and promote enhanced participation in local governance institutions, promote local entrepreneurship and bring rural population more resilient in future. On the other side of coin, in nutshell a “Smart Village” will be a unit who ensure the justified availability of sanitation facility, better-quality education, healthier and qualitative infrastructure, safe drinking water, easily accessible health facilities, environment friendliness, efficient resource use, modern computerized geo-technology based waste management system, move to renewable energy resources, development of smart aggro household industries, Computerized and efficient Animal care, smart dairy development from management, marketing, produce goods to services within the village boundaries and outside.

**Why Smart Villages in India:**

In India, villages were the arteries from historic times and were functionally almost self-dependent but during the course of time scenario reversed and they lag behind the developmental scenario. Backwardness takes place there at large scale in new economic orders. Because of all this now we are trying to bring fruits of development to the grassroots bottom level, importance must be fervent to the progress of rural development to smarten the rural population using means of ICT–GIS for the solutions and to regain self-sustainability. Smart villages will serve as complementary engines of economic growth to smart cities producing goods and services for local rural markets as well as high-value-added agricultural and rural industry products for both national and international markets (Jadhav2016). Imbalanced growth between rural and urban landscapes and unmanaged urban development leads to the challenge of rapid urbanization in already crowded Indian urban areas called towns and cities. Subsequently, uncontrolled urbanization brings some consequences such as lack of livelihoods, declined earning, the standard of living, and increased poverty and malnutrition.
of living, amenities and other facilities in the rural India. Smart village concept could play avital role in maintaining the balance between rural-urban areas. Ultimately it willproved conducive to reduce migration (Urban Overburdening) of rural population in urban areas. Due to present uncontrolled rural migration urban population density is increasing in hazardous way, Delhi bring its density near about double in ten years only were natural growth (due to births) is negligible against migratory addition in population. Numbers of cities are still inadequate to accommodate this large migratory population coming from villages. Practically it needs to be reversed for better management to improve the quality of life in Indian cities. The concept of “Smart Village in India” shall address the multifaceted challenges such as unplanned and badly managed urbanization, under-development of villages, Poverty, migration for economic pursuits, employment, and of utmost importance the better standard of living.

ICT_GIS Can Reshape Villages into Smart Villages:

Current century is now well recognized for introduction and development of information communication technologies. Development of ICT has proved conducive to change human life in various fields from. It reshaped developmental scenario. There are numerous technologies are coming every day to help mankind to reshape this globe in a more constructive way. Information and communications technologies (ICTs) are often used to assure the right to an education and learning and have a potential to serve developing needs (R Heeks, 2002). The various researchers have recognized the potential of ICTs for sustainable and eco-friendly rural development. Information technology (IT) can make a difference in a developing country only if it is designed in close collaboration with its users (Vesisenaho & Sutinen). Rural masses need more responsive techniques to resolve their issues from agriculture to public life. Based on the analysis on limitations of traditional rural planning and construction, the village planning needs to be a bottom-up process that focuses on the local community participation (Xun, 2008). Uses of Information and communications technologies and geo-techniques for the enrichment of rural life have huge capabilities and potentialities. Through applications of ICT, GIS-RS in various fields of the rural life can prove conducive to bring sustainability in developmental activities. Worldwide usages of the IT/ICT/GIS technologies has improved every sphere of living in urban areas. The rural population has remained neglected to some extent.

In the current scenario, mobile technology has played an important role in the socio-economic empowerment of rural communities from developed to developing countries. It fetches information quickly that improved responsiveness on the other hand. But there are some limitations in developing countries due to the unreliability of network infrastructures and their econo-political reasons. Availability of open and consistent access to required content and services can initiate the pathway of economic development from agriculture to household industries and further can change consumer habits in rural India. Furthermore developed ICT model has possibilities to empower rural communities in aggregate or as well as personally at different stages. The efficiency of mobile ICT infrastructure can help agriculture to convert in smart or climate smart agriculture by providing weather, irrigation, and hazards related information timely. It can also help farming communities to find a market for their products at far distant places without visiting there by using means of ICT-GIS. Further, it will assist to help in identifying system chunks/gaps, data analysis, resource monitoring, demand-supply gaps etc. While enhancing inappropriate technical and entrepreneurial skills can promote social norms and behaviors favorable to the realization of village/community development. (Ranade & others, 2015). The arrival of innovations, thoughts, techno-managerial skills are the fundamental basis of the developmental process in modern age world and those can be achieved by appropriate uses of ICT-GIS based technologies in rural settlement.

GIS as tool to bring Villages Smart:

Spatial information technology known as Remote Sensing GIS has developed at a remarkable pace over some times and will play a crucial role in reshaping the development scenario. Our traditional planning method using statistical data based analysis and display are very difficult to meet the needs of modern age multifaceted planning and management. Hence the usage of remote sensing data with Geographical
information system brings advantageous stage among researcher, planners, and managers. Geographical information system cleverly manage and convert spatial and attribute data in maps with multi layers and produce for users to go with it. “GIS mapping method is better than the hand Ding traditional cartography method to facilitate more flexible, based on the map, we can quickly produce a variety of high-quality planning needs of users using graph by adding special data, such as the development of villages and towns, villages and towns plan project planning chart. In the production planning map, can choose appropriate symbols and colors from the symbol and color library according to the actual need, make the best maps generated outstanding special effects and characteristics” (J. Li, 2009).

There are numerous ways to change rural life through use of geo-techniques in varied field of development such as settlement mapping, transport network planning, Administrative mapping, land-use land-cover mapping, terrain mapping, soil mapping, slope, drainage mapping, water shed mapping, waste management, water supply, sanitation and sewerage management, energy distribution management system, infrastructure mitigation, crop mapping, Market farm route shortening, farm mapping and management, agro industry location mapping, on site delivery management for needs and produce etc. are the fields where RS_GIS can play very crucial role.

RS-GIS can help in mapping existing settlement patterns and possibilities for future expansion in an eco-friendly way which promote sustainability. RS-GIS can play avital role in designing roads by shortening length it may reduce cost. Water distribution systems are acomplex combination of the water pipes, mains, valves, hydrants, service lines, and storage facilities. The shortest path analyses can be done using GIS that leads to sustainability of the system and also brings cost lower. Same can be applied to roads, sewage system, irrigation canal minor and their farm links, power lines &telephone/fiber data lines, farm market linkages etc. in all this remote sensing data procured by GIS software and human brain will lead to shortening of the path and ultimately cut the cost. Land use land cover and soil maps can be utilized to decide farming behavior and cropping choice. Drainage and irrigation system mapping can help farmers in rural areas to decide crop combinations by mixing their indigenous, modern knowledge and new techniques. GPS may be used in one site delivery in selling rural produce and ordering required seeds, equipment, and other required goods. It will definitely cost and time-saving for rural communities. Rural areas seem easily affected by disasters due to lack of awareness and preparedness. A planned disaster management plan with the help of ICT-GIS could meet mitigate to resolutions. Local disaster management cell could connect to the National Disaster Management Authority (NDMA) to the central server for monitoring. Hence there are uncountable possibilities of GIS remote sensing usage in rural areas to convert them in the smart village and developed areas from existing backward in comparison to their counterpart urban areas.

Conclusion:

Smart Villages became a necessity in current world development scenario. Sustainability needed for both rural and urban areas for better livelihood, here the Information communication and RS-GIS technology could offer an effective solution for this complex situation. With the introduction of computers, mobile phones/telecommunication services, remote sensing, Geographical Information system and GPS, the whole world of information has changed, not only for scientists, researchers but for masses. Every sphere of life from hut to space have tremendous changes. Through the application of Information communication technology and GIS technology in regional planning can prove conducive to bring changes and innovations in every sphere of life. It will bring information to rural masses in detail, reliable and accurate and furthermore will promote developmental activities. The uses of technology by rural masses will bring them more responsive. A particularly planned and appropriate framework for smart settlements or rural areas on the grounds of mix-up from Science & Technology, geographical information system, Eco Management and indigenous knowledge will play an important role to build next generation of smart villages. Adoption of new techniques and tool always need the courage to do and provide benefits to initial user. Availability of ICT, GIS techniques provide the scientific and rational basis for planning. Resultantly, a new rural development scenario is supposed to emerge where villages will be reshaped into smart villages by using means of...
information communication technology and geo-informatics.

References:


