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An Impact of Digitalization on Life in Rural Areas

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Abstract - *Digital possibilities create change. This change is necessary, especially when one looks at rural areas in India and their struggle to maintain social services, access to education, possibilities of employment, and the like under the pressure of demographic developments such as aging and an exodus of young, qualified citizens. This applies not only in urban settings but also in some rural parts of America, such as Mississippi, where some unique strategies on how to transition into the digital age can be found. This paper presents insights on how Americans employ today's digital possibilities regarding the structural framework, dissemination of knowledge, the mindset, and all-encompassing community development approaches for digital empowerment. The findings are that the potential for rural communities is tremendous. Applied in a well thought- out way, digital possibilities not only can create change but also may even create a future leapfrog effect for rural communities.*

Key Words: Gaon, NRuM, MPLADS.

1. INTRODUCTION

Digitalization is changing dynamics not only in many industries but also in terms of how society functions. The digital transformation or perhaps we should call it the "digital revolution," in accordance with the Industrial Revolution that probably influenced our society as much as this new transformation is already happening. Big data, collaboration tools, new (required) competencies – all of these are both opportunities as well as challenges for everyone, including people, governments, companies, organizations, living environments, and the like.

It is certain that the wealth of a nation is based on adapting digital tools in the near future (ISPRAT 2016). New expectations and hopes come up as any digital information can be delivered and received regardless of space and time. A National Agenda for Intelligent Infrastructure is not complete without explicit consideration of the needs of rural communities. While the American population has urbanized, the United States depends on rural communities for agriculture, fishing, forestry, manufacturing and mining. Approximately 20% of the US population lives in rural areas with a skew towards aging adults1. Further, nearly 25% of veterans live in rural America 2. And yet, when intelligent infrastructure is imagined, it is often done so with implicit or explicit bias towards cities. In this brief we describe the unique opportunities for rural communities and offer an inclusive vision of intelligent infrastructure research.

1.1 The Case for a Rural-Inclusive Intelligent Infrastructure

Before Rural communities differ from urban communities in ways that are relevant to intelligent infrastructure considerations. Most obviously, rural communities have sparse population density in comparison to cities. Rather than explicitly defining "rural", the US Census Bureau defines two types of urban areas, those with more than 50,000 people (urbanized areas) and those with 2,500-50,000 people (urban clusters). All other land and populations are considered rural. Under this definition, about 21% of the US population in 2000 was considered rural but more than 95% of the land area was classified as rural. In the 2010 Census, 59.5 million people, 19.3% of the population, was rural while more than 95% of the land area was still classified as rural. Sparse population densities drive many of the challenges facing rural areas; these are problems that differ from high density urban areas. They often lack the range of services that a city can provide to residents, such as robust public transit, and diversity of options, such as choices for healthcare. Further, for many years most rural communities have seen a decline in employment opportunities, and while that trend has slowed recently, the employment options are not the same as found in cities.1 That said some rural communities are seeing improving employment opportunities as the recreation industry grows, and it would be a mistake to take a deficit-only view of rural communities.

Instead they are the places some people live and others visit; crucially, Americans are dependent on their success (whether it be from relying on agricultural production, or ensuring that aging Americans and veterans have access to healthcare). Further, for an intelligent infrastructure, rural areas also challenge the dominant modes of thinking about the future of what it means to be smart: inviting consideration of different traffic patterns, pollution causes and locations, agricultural monitoring, aging in place, support for veterans, and so forth.

1.2 Foundations of Intelligent Rural Infrastructure

This whitepaper series defines intelligent infrastructure as "the deep embedding of sensing, computing, and communication capabilities into traditional urban and rural physical infrastructures such as roads, buildings, and bridges for the purpose of increasing efficiency, resiliency, and safety." 4 This definition makes clear that the foundation for intelligent infrastructure is the capability to move data from where it is gathered (sensing) to where it is processed (computing) to where it is used, via

communication networks. While these networks need not (and perhaps will not) be exclusively Internet-based, Internet access forms the foundation and backbone for intelligent infrastructure, allowing for real-time access and control, as well as efficient methods for gathering and integrating data into decision-making. The contrast between Internet access rates in rural versus urban areas remains stark. In 2015, the FCC changed the definition of broadband as access to download speeds of 25Mbps and upload speeds of 4Mbps. By this definition, 10% of all Americans lack access to broadband. However, this disparity breaks down into 39% of rural America as compared to only 4% of residents of urban areas.5 These disparities worsen as you consider the most rural of settings, such as Native American reservations where only 15% of residents regularly use the internet, primarily due to lack of access.

The lack of broadband access in rural spaces is caused by a convergence of factors that are exemplary when we consider challenges for intelligent infrastructure, including remote and difficult terrain, sparse population densities, lack of IT education, the lack of private investment due to concerns about profitability, and inadequate/outdated infrastructure (e.g., old copper-line networks that have fallen into disrepair, and that cannot support today's needed broadband data speeds). While some of these rural challenges could be solved by upgrading existing technologies (e.g., replacing old copper line networks with fiber); rurality and all of its conditions could also be a platform for innovation. Designing rural intelligent infrastructure that is robust in the face of power outages, works in the heat of the Mojave and the wetlands of the Atchafalaya swamp, and is located 100s of miles from any form of significant data processing capability or IT experts, presents important socio-technological challenges. Further, as the history of innovation in computing finds, technologies designed with these goals in mind are likely to find other relevant uses, and generate new industry and market opportunities fuelling the American economy.

1.3 'Gaon': A cluster of houses

'Gaons' (the word for villages in Hindi) have always been a vital part of civilization in India. A majority of the Indian population lives in rural areas. The history of Indian villages goes back to ancient times, where kingdoms comprised a major city and several villages. In these kingdoms, villages were a collection of households that cultivated the adjoining land. During the 1800s, the structure of Indian villages changed drastically. Walking was the only mode of transport in ancient times.

There was no alternative transport system for villagers until vehicles such as bullock carts, palkis, horse carts and boats were invented. These continued to be the primary means of transportation for many centuries. It was only in the late 1800s and early 1900s that villages witnessed a revolution in terms of transportation due to the introduction of buses, trains and other automobiles. The educational system has also significantly evolved throughout the history defined methodologies or standard development plans. The existing information and communication technology (ICT)/ Internet of things (IoT) methodologies have transformed the lives of even the urban population and can tremendously help villages metamorphose into smart villages. ICT/IoT initiatives will definitely help villages retain their people and provide them with livable surroundings that are at par with those of cities.

In the ancient period, Indian villagers used to be taught Vedic and other Hindu scriptures. These scriptures were the only means of education. From 1800 to 1900, diverse streams of education such as medicine and engineering became available. Similarly, in the case of occupations, cultivation and agribusiness were the prominent source of livelihood for villagers in ancient times. A great shift occurred in the 1800s when villagers started to move to urban areas and abandon their traditional occupation. Following rampant industrialisation, villagers began to be work as employees or labourers in urban areas.

1.4 The heart of the matter

According to the Planning Commission, a settlement with a maximum population of 15,000 is considered as a 'village'. India has more than six lakh villages.1 as per 2011 Census data, 68.84% of the Indian population lives in rural areas, and only 31.16% lives in rural areas. The rate of India's urbanization (namely the annual percentage change in the proportion of the urban population) is higher (1.1%) than the global average (0.9%). Agriculture is the main source of livelihood in Indian villages, along with poultry, pottery, fishing, rice and sugar industries. Villages in India are faced with the challenge of mass migration to urban areas by people seeking better opportunities and better quality of life. The major reason in most of the cases is social and economic stress and weak financial support. As per a Census report, rural to urban migration increased from 42% in 2001 to 56% in 2011.Another challenge that villages face is a shortage of employment opportunities. The permeable capacity of the agricultural sector is very low as diminishing returns have already set in the agriculture sector. As more educational avenues become available to the rural population, the quantum of relocation to urban areas will see a tremendous increase. The only way to prevent this is to induce an 'inverse movement' by providing basic infrastructure and utilities and promoting industrialization. This will lead to a steady increase in the employment opportunities in villages and ultimately solve basic issues in rural areas and ensure a healthier lifestyle.

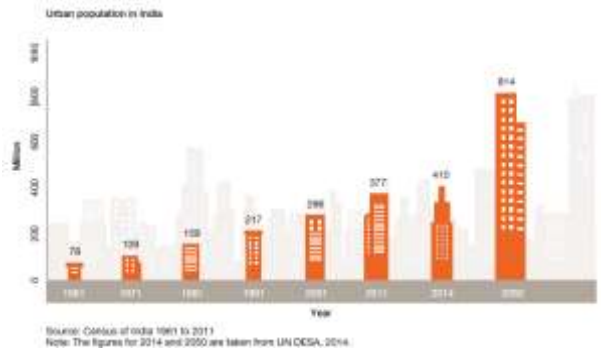

Chart 1: Urban Population of India

1.5 Global overview: Migration from rural to urban areas

Globally, more people live in urban areas than in rural areas, with 54% of the world's population residing in urban areas in 2014. In 1950, 30% of the world's population was urban. By 2050, 66% of the world's population is projected to live in urban areas.4 Migration from rural to urban areas has historically played a key role in the rapid growth of cities and, together with the reclassification of rural localities into urban centres, it continues to be an important component of city growth. However, natural increase—that is to say, the difference between births and deaths on site—can add significantly to urban growth, particularly in countries where fertility levels remain high. Today, natural increase makes a larger contribution to urban population growth than internal migration and reclassification in a majority of developing countries. In India, an estimated 20 million people migrate temporarily. Over 60% of this movement is between rural areas, with a majority of the people migrating from drought-prone provinces to regions of irrigated agriculture. Nevertheless, recent research suggests that as a consequence of agricultural mechanization, migration is increasingly towards urban centres and non-farm occupations. In northern Bihar, this type of movement has grown from 3% of the total migration in 1983 to roughly 24% in 2000. In Africa and Asia, circular migration is the predominant form of movement in many nations and regions. In drought prone areas like Asia, there is a long tradition of temporary migration as a coping strategy.7 The levels of urbanisation have increased most rapidly between 1950 and 2000—from 14.5 to 36% in Africa, and from 16.3 to 36.8% in Asia.

1.6 Smart village initiatives around the world

Many initiatives are being implemented worldwide to make villages self-sustainable by using smart technology like ICT and IoT and hence reducing migration towards urban areas. Some of the examples of global smart village initiatives are:

1.6.1 National Rurban Mission (NRuM), Ministry of Rural Development, Government of India

NRuM was launched by the Hon'ble Prime Minister on 21 February 2016. NRuM follows the vision of 'Development of a cluster of villages that preserve and nurture the essence of rural community life with focus on equity and inclusiveness without compromising with the facilities perceived to be essentially urban in nature, thus creating a cluster of "Rurban Villages"'.14 The objective of NRuM is to stimulate local economic development, enhance basic services and create well-planned Rurban clusters. The larger outcomes envisaged under this mission are: (i) bridging the rural-urban divides— namely economic, technological and those related to facilities and services; (ii) stimulating local economic development with an emphasis on reduction of poverty and unemployment in rural areas; (iii) spreading development in the region; and (iv) attracting investment in rural areas. A Rurban cluster is a cluster of geographically contiguous villages with a population of about 25,000 to 50,000 in plain and coastal areas and a population of 5,000 to 15,000 in desert, hilly or tribal areas.

1.6.2 Smart Cities Project: 60 Smart Villages in India

Faced with the challenge of transforming rural India, the Centre has selected 60 villages in three districts—Rajgarh, Sehore and Satna—which will be developed as smart villages under the ambitious Smart Cities (or villages) project. The government will provide funds for the development of specific aspects of these villages. Under this project, each village will get 25 crore INR. The government will focus on climate change, smart energy, agriculture and water. Smart village development will be brought about in the state in coordination with the Environment Planning and Coordinating Agency (EPCO). The proposal was developed in association with the National Bank for Agriculture and Rural development (NABARD) and will focus on uplifting rural areas through greater credit flow to give a push to the agriculture and rural non-farm sectors. The duration of the project is three years. Twenty villages have been selected for development in districts tagged as climate-smart villages.

1.7 Government schemes to support smart villages

1.7.1 Unnat Bharat Abhiyan (UBA)

UBA is a program by the Ministry of Human Resource Development, Government of India, to uplift rural India. The program is being launched in collaboration with the Indian Institutes of Technology (IITs), National Institutes of Technology (NITs) and other leading government engineering institutes like the College of Engineering, Pune, across the country. The program involves engaging with neighboring communities and using technologies for their upliftment.

Vision: To involve professional and other higher educational institutions of the country in the process of indigenous development of self-sufficient and sustainable

village clusters in tune with the notion of 'GramSwaraj' propounded by Mahatma Gandhi. It also aims to create a virtuous cycle between society and an inclusive university system by providing knowledge and practices for emerging professions and to upgrade the capabilities of both the public and the private sectors.

1.7.2 Pradhanmantri Adarsh Gram Yojana (PMAGY)

Model Village

Prior to PMAGY, the Adarsh Gram scheme was implemented in pilot mode in 1,000 villages of Assam, Bihar, Himachal Pradesh, Rajasthan and Tamil Nadu, with an allocation of 20 lakh INR per village. The target villages under the scheme were those with more than 50% of the population belonging to Scheduled Castes (SCs).

1.7.3 Sansad Adarsh Gram Yojana (SAGY)

The Central Government's SAGY initiative aims to involve MPs more directly in the development of model villages. By adopting a village(s) under this initiative, an MP has the opportunity to directly benefit all sections of a village community in an integrated, efficient and participatory fashion. Roles of various entities in SAGY: Role of an MP – The primary roles and responsibilities of an MP under SAGY are identifying the gram panchayat, facilitating the planning process, mobilizing additional resources as and when required under the plan and filling in critical gaps using Members of Parliament Local Area Development Scheme (MPLADS) funds. Two national-level committees will monitor the implementation of the scheme: One committee will be headed by the Rural Development Minister and include the ministers in charge of planning and program implementation. The second committee will be headed by the Secretary, Rural Development, with representatives from various other ministries/departments relevant to SAGY. The state-level committee will be headed by the State Chief Secretary and include experts from various disciplines. The Secretary of the State Rural Development Department will serve as the member-convener of this Committee.

1.7.4 MPLADS

MPLADS was introduced in December 1993. The objective is to enable Members of Parliament (MPs) to suggest and execute developmental works of capital nature based on local needs, with an emphasis on the creation of durable assets. Under this scheme, each elected member of the Lok Sabha suggests developmental works in his constituency. The elected members of Rajya Sabha can recommend works in any district of her or his state. Nominated members of the Lok Sabha and Rajya Sabha may also select works for implementation in one or more districts anywhere in the country.

Related work on Rural Area

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Nevertheless, recent research suggests that as a consequence of agricultural mechanization, migration is increasingly towards urban centers and non-farm occupations. In northern Bihar, this type of movement has grown from 3% of the total migration in 1983 to roughly 24% in 2000.

2.1 Smart village initiatives around the

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2.1.1 The Millennium Villages Project

The Millennium Villages Project involves partnership between academia, civil society, local governments, United Nations agencies and the private sector to achieve the millennium development goals (MDGs). The holistic approach focuses on an integrated package of interventions in agriculture, education, health, roads, power, ICT, water and sanitation, and business development. During the first five years of its operation, the Millennium Villages Project has achieved success by increasing food security, reducing hunger, improving education, decreasing maternal and childhood mortality, improving local infrastructure, and controlling malaria, AIDS and tuberculosis. The Millennium Villages Project currently operates in 14 clusters of villages in 10 countries in sub-Saharan Africa, reaching more than 5,00,000 people. It has demonstrated how ICT and broadband can be used to enhance development through projects ranging from mobile applications for decision-making support in the health sector, to the use of mobile phones for data collection and systems management, to classrooms enabled with innovative technologies. The project, in particular, focuses on using ICT in three crucial

areas: strengthening primary health systems though expanded mobile-health services; scaling up access to high-quality secondary education for girls through connectivity at schools; and providing access to renewable energy (electricity) and safe water using smart metering and broadband-enabled systems.

2.1.2 Info poverty Program by OCCAM

In 2001, the Observatory for Cultural and Audiovisual Communication (OCCAM) launched the Info poverty Programme, which focuses on creating ICT villages in remote areas and ensuring primary services in food security, e-health and e-learning to the population. The OCCAM program focus on the following key ICT initiatives to fight against poverty: 1) telemedicine—to provide professional medical services through ICT in cases where access to healthcare is limited; 2) e-learning—to promote remote teaching, making learning interactive not only for primary and secondary schools but also for continuing education; 3) e-agriculture—to promote food security; 4) e-governance—to enhance services related to public administration.

2.1.3 Smart village as a platform (SVP)

The model for smart villages will comprise interconnected smart solutions in infrastructure as well as ICT. The purpose of the ICT platform is to draw villagers into the management process, both individually and collectively, in order to enhance citizen awareness, implement e-governance for administration transparency, and increase employment through smart ICT and non- CT solutions in order to upgrade the standard of living and day-to-day activities to a level that is on par with that of urban dwellers.

1) Title: An ICT approach to rural metamorphosis

Author: Neel ratan

Publication Year: 2011 ICACT

Method: The IoT describes a worldwide network of billions or trillions of objects that can be collected from the worldwide physical environment, propagated via the Internet, and transmitted to end-users. Services are available for users to interact with these smart objects over the Internet, query their states, as well as their associated information, and even control their actions. IoT paves the way for a smart world by connecting everything. IoT is 'a dynamic global network infrastructure with self-configuring capabilities based on standard and interoperable communication protocols where physical and virtual "things" have identities, physical attributes, and virtual personalities and use intelligent interfaces, and are seamlessly integrated into the information network.

2) Title: "Digitalization: Status Quo and Future Trends – A New Impact on Life in Rural Areas?"

Author: Mareike Meyn

Publication Year: 2017 ACG

Method: This paper set out to determine what kind of role digitalization plays for rural communities within the U.S. and how it can create change. The answer is that digitalization can play an important role for the empowerment of rural communities in the U.S. and also in other rural settings around the world. However, a holistic approach to digitalization is not very easy to follow through on, especially since access to high-speed Internet is still not a given in rural America and the digital divide is prevalent. Of utmost relevance for rural development is broadband and how it is used. If there are no approaches and policies on how to apply and use digital technologies, the chance to bridge the digital divide between rural and urban areas has not been pursued.

3) Title: A Rural Lens on a Research Agenda for Intelligent Infrastructure

Author: Ellen Zegura

Publication Year: 2016 USDA

Method:

A National Agenda for Intelligent Infrastructure is not complete without explicit consideration of the needs of rural communities. And yet, intelligent infrastructure is often imagined as "smart cities" with bias towards urban needs. We propose a Rural-focused Intelligent Infrastructure Act: technological platforms, applications, supported by appropriate policy that empowers rural communities. At its core, we believe that the rural United States presents exciting possibility for groundbreaking innovations with outcomes that will benefit not just those who live and work there, but the American economy more broadly.

4) Title: Resources Of Environment: Aspects Of Smart Rural Development

Author: Maira Ore

Publication Year: ESRD 2017.

Method: Smart rural development is affected by

Environment. Smart environment is an innovative ambient system in which a person is willing and able to make effective use of technological and natural resources with an aim to improve the quality of life and competitiveness while ensuring skilled and sustainable use of natural resources satisfying the economic, social and environmental aspects of the present and future generations. The authors identify the main environmental components: road and communications, available nature resources and their usage. State and local government strategic documents use different programming

methodology, in some cases there is no indication of a specific action to reach certain goals, a single performance indicator system for goal assessment has not been elaborated, which limits objective assessment of achievements and comparative analysis of moving to sustainable long-term development on a regional, national and international scale. Policy makers should agree upon a single theoretical framework for smart development that would serve as a basis for development of coherent planning documents.

3. CONCLUSION

Today, there is no doubt that villages need to become smart. The biggest challenge facing all developing countries is making existing technologies accessible to villages through different schemes and activities. These schemes often fail due to lack of strategy, planning and implementation. The smart city ecosystem of a village needs to be established while taking into account the location and investment climate for emerging growth approaches for smart villages. This model should be easy to replicate and should be sustainable for millions of small villages and towns around the world. By means of smart solutions like solar energy produced and used locally, villages can move to the next level of development. SVPs can reduce the dependence on fossil fuels and contribute to the reduction of greenhouse gases such as carbon dioxide. This will optimise energy saving by 25–30%. E-learning facilities will allow farmers to ask questions on farming and organic ways to cultivate crops online. Making villages self-sustainable could create employment in villages, thus reducing migration to nearby urban areas.

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