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SMART INDIAN VILLAGE MODEL FOR IDEAL SETTLEMENT IN INDIA

Imran Nazir
Department of Civil Engineering
BIT Sindri, Dhanbad, Jharkhand, India

Abstract— **In India 833.3 million people remain without proper electricity, are still cooking on inefficient stoves, and lack all proper standard facilities. In remote rural village communities, we need to develop and improve lives. Smart villages capture many of the benefits of urban living while retaining all the aspects of rural life and ensuring development at the national level. This enables villagers to attain healthy and fulfilling lives, achieve development, earn a sustainable living and be connected to the urban world. Technology can become a standard playground if the Smart Village Framework is implemented in a completely analytical way. Besides Technology best practices, motivated teams and village social aspects can transform the villages. This paper deals with the various attributes related to a Smart Village and are being analyzed using Extenics and a Smart Village Planning Framework is suggested for Indian villages.**

Keywords— **Village Development, Smart Village, and Internet of Things**

I. INTRODUCTION

The Future of Indian lie in Its Village. Mahatma Gandhi mentioned the above statement more than half a century ago and even today, the statement holds true. According to the Census of 2011, around 68.8% of Indians (around 833 million people) live in 640,800 different villages. The size of these villages varies with many factors. More than 230,000 Indian settlements have fewer than 500 inhabitants, while around 4,000 villages with 10,000+ inhabitants. Most of the villages have their own temple, mosque, or church in the locality. In India there are 6,00,000 villages out of the 1,25,000 villages that are backward and the standard of living is below the normal index. So there is a need for designing and building the village as a smart village with new edge technology. Hence, it becomes mandatory for obvious discussion for developmental efforts to materialize into socio-economic growth, our efforts must cater to the needs and aspirations of this large populace.

A. Past Development of Villages in India –

The results of the study are analyzed and discussed in the following section. The upcoming section presents an introduction about the state including the parameters related to development. This is followed by a review of approaches sectors such in the Five -Year As Plans in forest, land, agriculture, Selected joint forestry, drinking water and energy, and rural infrastructures. It provides case studies with respect to villages selected from across the state. The village study analysis provides a brief summary of varying situations across the state's villages under various circumstances with insights into the development with micro-level perspectives. It also discusses the government schemes and programs launched in various states of India.

B. Status of Village Development –

a. Agriculture Sector

Agriculture is the largest sector of the state's economy. Its share being the highest both in employment as well as instate income. However, there is a gross imbalance in these shares, and unlike the other sectors of the state's economy, its share in state income of the state is far lower than its share in total workers. As a result, the average income per worker of this sector is far less compared to the corresponding income per worker in other sectors of the economy. The average income per employee in key sectors in 1991 is provided below-

The main reasons for the above are mainly due to the low production of major crops in many parts of the state. Lack of diversification of agriculture from low to high yields, inadequate and inefficient rural development infrastructure and limited employment in some of the more lucrative economic sectors required for agricultural workers to move forward are some of the main and immediate reasons for these practices. Unless the development process in the state is addressed to these fundamental causes, agricultural growth and the issue, the economy as a whole will not rise to the desired level and the demographic responsibility for agriculture can sustain itself. reduction.

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TABLE 6.1

Average Income Per Worker

Sector	*Income (Crores Rs.)*	*No. of Workers (Lakh)*	*Average Income Per Worker (at Current Prices in Rs.)*
Agriculture	20846.24	301.60	6,912
Manufacturing	6879.18	32.05	21464
Others	21770.82	79.96	27347
Total: All Sectors	**49496.24**	**413.61**	**11967**

Source: Government of Uttar Pradesh, *Tenth Five Year Plan (2002-2007)* and *Annual Plan Vol.1 (Part 1)* of Lucknow.

Fig. 1. Table Average Income Per Worker

b. Irrigation -

It is evident from the tables that more than a quarter of the state's land was planted and nearly one-third of its total land area for 1998-99 was irrigated. The loss of impact on agricultural production in this account and its impact on the state economy, as a whole, while agriculture continues to be a dominant sector, is not difficult to imagine.

TABLE 6.2

Gross and Net Sown Area

1998-99	*Lakh Ha.*	*1998-99*	*Lakh Ha.*
Net Sown Area	175.85	Gross Sown Area	261.62
Net Sown Area with Irrigation	126.91 (72.2%)	Gross Irrigated Area	176.98 (67.6%)
Net Sown Area without Irrigation	48.94 (27.8%)	Gross Area Sown without Irrigation	84.64 (32.4%)

Fig. 2. Table for overall Irrigated land

c. Roads & Bridges-

There are 53945 sites (55%) from 97134 state districts, which are not yet connected. This gives an idea of the size of the problem that remains unresolved. The extent to which these roads have proved useful for agricultural development will ultimately depend on quality and repair.

d. Electricity-

It is the main Source of illumination and many states were crippled with a shortage of power. As claimed now India has each village electrified under the deen dayal upadhyay scheme. There was a time when there was no electricity in villages except kerosene lamps and torches. Now, even villages having access to electricity face disruption or discontinuity of electricity for a longer period of time.

So all of the above data suggest a strong and better smart indian village model in order to uplift the conditions of the majority of Indians. The approach would be to give all the technical advancement and at the end a complete village settlement plan.

II. AGGRICULTURE

Climate–smart agriculture is one of the techniques that can maximize agricultural outputs through proper management of inputs based on climatological conditions with smart implementation. A real weather monitoring system is an important tool for monitoring the weather of a farm because many farm-related problems can be solved by better understanding the surrounding weather conditions and ultimately improving productivity.

A. **Introduction –**

Smart farming is a way to do agriculture by precisely managing the inputs based on variation of field parameters in order to achieve optimized production at minimum disturbances to the environment. It is well known that climate is one of the most imperative field parameters that determine plant growth. This is because different plants are susceptible to certain growing conditions such as air temperature, relative humidity, soil temperature, wind and light. Therefore, it is important for farmers to understand the climatic conditions of their farms and to solve the major parts of the problems in managing farms to maximize production while achieving environmental goals can be solved with appropriate information collected from the weather stations installed in the farm.

Weather stations help to understand the interactive influence of climate and management factors on crop yield. The use of a real-time weather monitoring system is one of the most effective ways to equip farmers with timely climatic information and knowledge for better crop behaviour and management.

Fig. 3. Weather station Installed in the farm

a. Weather Station (Transmitter Node)

The weather station is used for collecting the data of weather from the farm. It comprises two main components:

1) the solar charging system for harvesting energy from sunlight

2) data collector and transmitter unit Weather Station Hardware Diagram

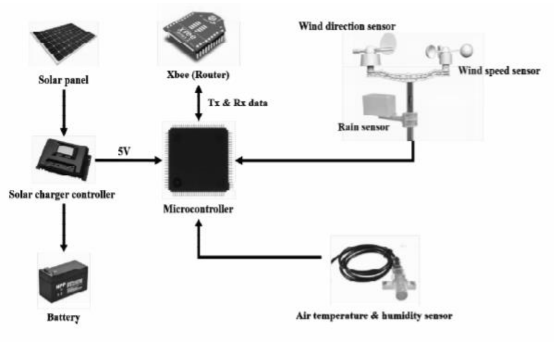

Fig. 4. Weather Station Hardware Diagram

b. Solar charging system

In this work, solar cells are used as a power source for the weather stations, harvesting energy from the sun to support the weather stations is more appropriate and cost-saving in long-term operation. The system consists of a 20-watt solar cell panel, solar charging control which provides 5V output for the data collection board and 12V to charge the battery, and 12V/21AH battery.

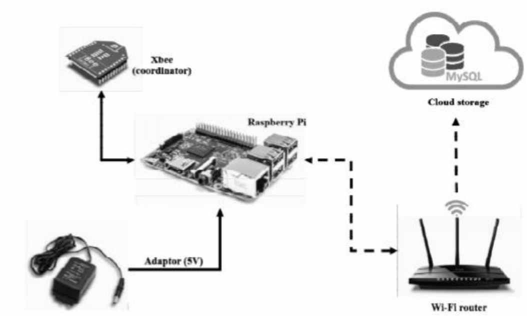

Fig. 5. Hardware Diagram for Base Station

c. The data collector and transmitter unit

A microcontroller from Microchip, PIC24FJ64, was selected as a main central computing unit (CPU) for every transmitter node. The PIC24FJ64 family has a 16-bit (data) modified Harvard architecture with an enhanced instruction set. A24-bit instruction word with a variable length opcode field and this CPU includes several features intended to maximize application, flexibility and reliability.

d. Base Station (Receiver Node)

In addition to the transmitter node design, a base station is required. The good management of the receiver node allows the system to have more stability, prevent data loss between communication, and save the power of the transmitter node. In this work, a single board computer called Raspberry Pi 2 model B was used as the brain of the base node. For a low cost single board computer, Raspberry Pi has all necessary ability to be used as a base station. Hardware Diagram for Base Station The Raspberry Pi runs Linux and iis a low cost besides comprising of all necessary component such as:

(1) 4 USB x 2.0 host ports that is easy to connect with transmission module such as Xbee-Pro S2 and wireless USB dongle,

(2) HDMI port to connect with an external monitor for monitoring application,

(3) micro SD card for data storage.

III. IRRIGATION

Water is a very important concept in the development and growth of agricultural production, so the expansion of irrigation has become an important strategy for rural agricultural development. India's irrigation capacity increased from 22.6 m in 1951 to about 90 m at the end of 1995. It is estimated that even after obtaining full irrigation capacity, about 50 percent of the total planted area will remain in the rain and this will exacerbate the problem of many uncultivated lands.

When we analyze the growth of agriculture over the past forty years, we find that the more productive varieties, the expansion of the irrigated area and the use of fertilizers have been major contributors to the green revolution in India. But still the villages do not have high-quality irrigation facilities that eventually lead them to live in areas near lakes or ponds and ultimately reduce agricultural productivity. Lack of clean water is also one of the biggest problems farmers face. Water from other sources is not suitable for irrigation.

So there is a need for something which is economical and viable for villagers . IOT Based Remotely Controlled Irrigation system: India faces over employment in terms of land productivity. So a smart automation system is required so that apart from farming there could be another source of income.

A. **IOT Based remotely controlled irrigation system –**

An IOT Based remotely controlled irrigation system proves to be an viable solution. The system works in

(i) an admin mode

(ii) one time setup

(iii) continuous monitoring modules.

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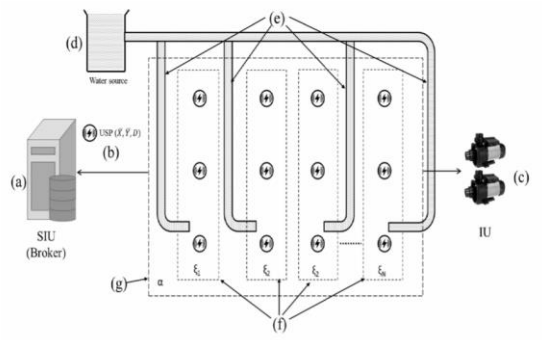

Fig. 6. Wireless field view of proposed system implementation

It starts with an admin mode for specific time duration in which the user needs to input data for the crop type that is to be planted and for which time schedule is desired, and soil type. After admin time-out, a one time setup is done which loads the crop related data taken from user, which is then used to compute the evapotranspiration and the irrigation needs. Irrigation unit Irrigation the plants after receiving data from trained models through WIFI connectivity.

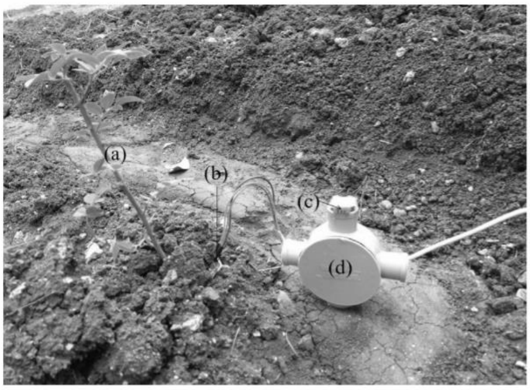

Fig. 7. Irrigation unit Irrigation the plants after receiving data from trained models through WIFI connectivity.

The sensors give the environmental and soil water status that provide with statisticals data in τ intervals, and it uses them for computing the irrigation requirement. It controls the sensors and is responsible for the decision making and sending requests to the trained model. The prototype is inserted at locations to get the real time physical data and analyze it. Irrigation is done by an irrigation unit based on the data received from a trained model through WiFi (client-server scenario).

IV. ROADS & BRIDGES

Fig. 8. Example of damage to a road by a landslide in the village of Halenkovice in July 1997 when the road embankment subsided by 1 m. Photo A. Horká.

A. Low Cost Concrete Roads For Villages –

The roads in villages have to be sustainable and economical as the mode of transportation is not just cars or bikes but also bullock carts etc . This requires a special demand in the road design. IIT Kharagpur has developed a technology for the construction of roads with flexible concrete at a cost lower than that of a black top road. The expected life is about 20 years. With little maintenance The Method of construction makes the concrete flexible, economical and viable and the surface does not crack . It is labour based, maintenance Free. It also generates local employment in the villages These roads can also be used in overlays over damaged black top roads, pavements of footpaths,roads of housing complex, container yards, haul roads near a mine, bus stops,parking areas of light and heavy vehicles . Now let's discuss the technology involved.

B. The Technology –

The formwork of recycled plastic in the form of a network of cells of size

150mmX150mm

200mmx120mm

and depth from 50mm to 100mm and placed over a compacted foundation. The foundation of the road is prepared as per specifications for road construction. A formwork of cells of polyethylene sheets is placed across the full width of road under tension .Edge protection is provided by brick on end edge or concrete blocks.Shoulder protection up to 0.80mm on either side is necessary for preventing damage from edges. The cells can be filled with different types of concrete as described below.

The formwork of the cell is under tension over a foundation. A concrete 30 MPa strength with a slump of about 40 to 60mm is placed inside the cells which are overfilled by 15 mm. The concrete is well vibrated by a surface vibrator. A little vibration is needed for compaction if the slump is about 50 to 60mm. Upon compaction, the thickness of pavement is about 90mm depending upon the overfilling, and a superplasticizer was used for reducing the water requirement. The curing of concrete by jute mats has to be done for about two weeks.

The constructed part of the road was opened to light traffic such as bicycle, motorcycles,cycle-rickshaw after two days. Laterite boulders were used in West Bengal for shoulder protection. A granular sub-base with stone blocks at the edge of the cell-filled concrete pavement was used at Doddaballapur in Karnataka.

C. Bridges –

There has been new advancement in the area of bridge engineering in India with the introduction of the limit state design concept, new special vehicle loads, and fatigue vehicles for bridge design and usage of construction materials with high yielding strength. With this development now it is possible to achieve a target design life of 100 years for concrete bridges. This paper discusses two bridges design considering the factors like economical and space constraints. The first design is a simple timber bridge for small space and economical design.

D. Timber Bridges –

Wood has been the first material used by humans to construct a bridge. Although in the 20th century concrete and steel replaced wood as the major materials for bridge construction. Timber's strength, lightweight, and energy-absorbing properties furnish features desirable for bridge construction. Timber is capable of supporting short-term overloads without adverse effects. Now in the villages area where construction work can't be done easily but skilled labors are easily available.

Timber bridges revolve around the basic Trusses concept for structural frames consisting of straight members connected to form a series of triangles. In bridge application, a typical truss superstructure consists of two main trusses, a floor system, and bracing. These superstructures are classified as deck trusses. Timber trusses are constructed in many geometrical configurations. Two Of the most popular are the brown string truss and parallel-cord truss.

In the bowstring truss, the top chord is constructed of curved glulam members or a series of straight sawn lumber members. As a pony truss, bowstrings are generally the most economical of all truss types for spans up to 100 feet for small scale it should be the ideal in villages connectivity. For longer spans, the bowstring is designed as a through truss. Parallel-chord trusses are constructed in various through-truss or deck truss configurations for spans up to approximately 250 feet. As a deck truss, parallel-chord designs are practical when vertical clearance is sufficient for the truss depth and are especially economical for deep crossings where reduced bent height can result in substructure savings

V. SOCIAL FOLLOWUPS FOR THE VILLAGE

The smart attributes for a typical Indian Village are Accessibility, connectivity to broadband, education, awareness of opportunities, and Will to make a village model not only with smart equipment but also with social aspects. Every village has a unique identity in terms of traditional occupation which can be improved by enhancing techniques and developing new markets. The smarter attributes defined would lead to a SMART plan for ideal settlement which is the outcome of this stage.

Few Factors to be considered

A. Housing –

A Khaccha or Pucca House but with proper Solar energy, Toilet Water connection, Community Centers for every 100 families and also Place of Worship.Traditional House / Steel / Prefabricated Local material / 2kW per house with at least 1 Septic tank and Toilets 1 Water connection 50 litres per person Hall, Library, Office of Mohalla Committee Rotational Maintenance Volunteers.

B. Health and Wellbeing –

Every individual has a Health Card Insurance well experienced Doctor Nursing and Medical Shop with Telemedicine Ambulance.1 Family card linked with Adhar card 10 k Family Insurance from Govt Scheme 1 Doctor 3 nurses, 1 compounder Allopathy and Allied Medical Branches 24x 7 medical shop.

C. Education –

Primary Education with Counseling, Development Library. Introduction for Skill Development.

1 Primary Education for basic reading writing speaking skills in local language 5 Counselors centers 1 Library with 24x7 access with a hall for discussing development PMKVY (Prime Minister Kaushal Vikas Yojana)

D. Poverty –

Poverty is quite a big challenge and removal through Decent Work & Economic Growth, Provide Employment Opportunities Self Employment SHG (Self Help Groups). 70 - 80 % MENREGA Data to benefit desired beneficiaries 25 Skill trades as per local needs: Traditional Art, Food Products, 10 SHG each year

E. Hunger –

Food Stocking & Warehouses as per population need.Building Cold storage as per village needs

F. **Participative Governance –**

Mohalla Committees are an excellent way to involve the village in active participation to discuss and come up with ideal solutions for common problems.

VI. CONCLUSION

The smart village model can be developed as an alternative model of village development for ideal settlement in order to increase the number of self-sustaining villages in India. This model covers dimensions that should be considered, namely (1) Agriculture, (2) Irrigation, (3) Roads, (4) Bridges, and (5) Sustainability with several indicators and ideal solutions.

However, the implementation of this model cannot be equated in all villages in India because it highly depends on the resources, characteristics, and local wisdom of each village. The smart village model that is proposed is still conceptually developed so it still needs further follow-up through researches that apply this model based on the village potencies, such as a climate-smart village, smart agriculture village, smart tourist village, and so on. In addition, it is also necessary to develop a measurement model for the implementation of smart villages

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