

# Roadmap of Smart Gram Panchayat

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**Abstract** — Each element of the roadmap is discussed, emphasizing the potential impact on rural life. For instance, smart entrance gates enhance village security and aid in monitoring activities. Road monitoring ensures well-maintained transportation infrastructure, and street light monitoring improves safety and facilitates maintenance. Garbage collection initiatives contribute to cleanliness and disease prevention, while drainage monitoring addresses blockages. Water purification and healthcare solutions mitigate health risks, and education initiatives, including smart attendance systems and e-libraries, enhance educational opportunities. Transport monitoring addresses transportation challenges within the village. Advocating for small-scale pilot implementations in a few Gram Panchayats to monitor and evaluate the effectiveness of IoT solutions in real-time. This approach, coupled with community feedback, can serve as a model for scaling IoT technologies in rural governance, leading to sustainable development and improved quality of life in rural communities.

**Keywords:** Smart Gram Panchayat, Internet of Things (IoT) Technologies, Rural Areas

## I. INTRODUCTION

In recent years, there has been a notable surge in the exploration of integrating Internet of Things (IoT) technologies into rural areas, particularly within the context of Gram Panchayats in India. This burgeoning field of scholarly research is dedicated to unlocking the potential of IoT advancements to not only augment local governance structures but also to substantially improve efficiency and catalyze rural development. The existing body of literature sheds light on the myriad challenges faced by Gram Panchayats, encompassing issues like deficient infrastructure, limited resources, communication complexities, and data management challenges.

Moreover, on a global scale, rural development projects have showcased the transformative power of innovative IoT applications. These include the deployment of sensors, utilization of data analytics, and establishment of communication networks, all of which have revolutionized various facets of rural life such as agricultural practices, infrastructure, healthcare, and education. Against this backdrop, the integration of IoT technologies into the fabric of rural governance, especially within the Gram Panchayat framework, emerges as a potent force with the capacity to reshape rural landscapes. It holds immense promise for ushering in positive changes and addressing longstanding challenges that have hindered the development of rural areas.

Undoubtedly, Gram Panchayats face obstacles that range from insufficient infrastructure to communication gaps, yet strategic investments, collaborative endeavors, user education, and a commitment to continuous evaluation stand out as pivotal elements in overcoming these limitations. These elements form the linchpin of a successful

implementation of IoT-based solutions, which, in turn, holds the potential to contribute significantly to the sustainable development of rural communities.

## II. COMPONENTS OF ROADMAP

The vision of creating an IoT-based smart village requires meticulous planning, strategic implementation, and collaboration among a diverse array of stakeholders. To chart a path toward the realization of this vision, a roadmap has been formulated, delineating the steps and key considerations for implementing IoT solutions in rural governance within the framework of Gram Panchayats. Let's delve into the components of this roadmap:



Roadmap to make a smart gram panchayat

- 1 Complete update regional data of village.
- 2 Sensor base smart visitor counter entry gate.
- 3 Road monitoring system.
- 4 Street light monitoring system.
- 5 Smart garbage collection system using.
- 6 Smart health system.
- 7 Smart education system.
- 8 Smart Transport system by panchayat.

Fig. 1: Roadmap of smart gram panchayat

**A. Smart Regional Data:**

Regional Information Management Systems are systems that help give individuals more control over their village data. Regional Information Management Systems allow to manage categories wise record, literacy Rate, age wise record, former etc data in secure, local or online storage systems and share them.

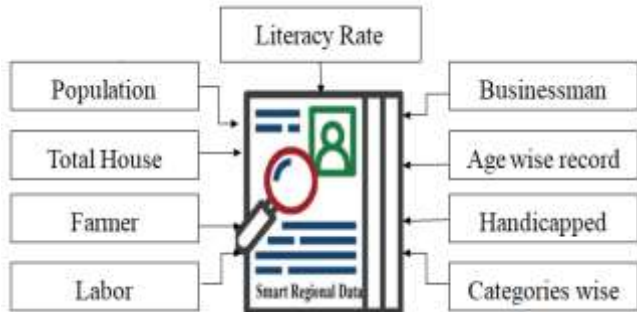


Fig. 2: categories wise Regional data

**B. Smart Entrance Gate:**

The establishment of a smart entrance gate aims to enhance village security by monitoring activities. It provides valuable insights into the presence of known or unknown individuals in the village, tracks their entry frequency, and maintains an accurate count of village members.



Fig. 3: Sensor base smart gate for visitor counter

**C. Road Monitoring:**

A robust road monitoring system, initiated from a smart gate, facilitates the assessment of village development. It ensures well-maintained transportation infrastructure, contributing to smooth connectivity within the village and with the broader city.



Fig. 4: Road monitoring by panchayat

**D. Street Light Monitoring:**

IoT-based street light monitoring addresses issues related to safety and accessibility in villages during nighttime. It enables the tracking of functional street lights and allows for

timely maintenance, promoting safety and reducing risks, especially for women.



Fig. 5: Street light monitoring system

**E. Garbage Collection:**

Garbage collection initiatives are essential for maintaining cleanliness and preventing diseases. Strategically placed dustbins equipped with sensors can signal when they need to be emptied, providing the Panchayat with data on the types and quantities of garbage generated in the village.



Fig. 6: IoT-based garbage collections by panchayat

**F. Water Purification:**

Addressing the critical issue of water pollution, an IoT-based water purification system continuously monitors water quality. This early detection allows for timely intervention, ensuring a safe and clean water supply for villagers.



Fig. 7: Water monitoring system



Fig. 9: Smart education system for rural areas

**G. Health:**

Remote healthcare services through IoT can bridge the gap between rural areas and medical facilities. E-clinics and telemedicine platforms connect villagers with healthcare professionals, offering timely consultations and reducing the need for travel.



Fig. 8: IoT-based health system

**H. Education:**

Smart attendance systems and the establishment of e-libraries and computer centers contribute to educational advancement. Additionally, promoting distance education options reduces the necessity for rural students to migrate to cities for further studies.

**I. Transport Monitoring:**

Transportation challenges in villages can be addressed through facilities like buses, taxis, or e-rickshaws. Implementing a tracking system for these services ensures efficient and accountable transportation options for villagers.



Fig. 10: smart transport tracking system for panchayat

**III. LIST OF IOT ENABLED DEVICES AND THEIR WORKING AND USAGE**

The advent of IoT presents a transformative opportunity for the infrastructure of smart Gram Panchayats, ushering in a revolution that promises to reshape education, health, and various other sectors. This technology carries the potential to elevate productivity, optimize teaching and learning methodologies, and substantially cut down operational costs. The subsequent sections will delve into dedicated IoT-enabled devices designed for specific sectors outlined in the table below, providing detailed explanations for each sector in the subsequent parts of this description.

S_no	Sector	Hardware	Technology
1	Regional Data	Computer ,Laptop,Mobile	Mobile App
2	Entrance gate	<ul style="list-style-type: none"> <li>- micro-controller</li> <li>- servo motors</li> <li>- ultrasonic sensors</li> <li>- IR sensors</li> <li>- Sharp ir sensors</li> <li>- relay modules</li> <li>- power supply unit</li> </ul>	<ul style="list-style-type: none"> <li>- IOT</li> <li>- RADAR</li> <li>- Sensor reading</li> <li>- Embedded system programming</li> </ul>
3	Garbage monitoring	<ul style="list-style-type: none"> <li>- micro-controller</li> <li>- servo motors</li> <li>- ultrasonic sensors</li> <li>- relay modules</li> <li>- power supply unit</li> </ul>	<ul style="list-style-type: none"> <li>- IOT</li> <li>- RADAR</li> <li>- Sensor reading</li> <li>- Embedded system programming</li> </ul>
4	Road monitoring	<ul style="list-style-type: none"> <li>- micro-controller</li> <li>- servo motors</li> </ul>	<ul style="list-style-type: none"> <li>- IOT</li> <li>- RADAR</li> </ul>

		<ul style="list-style-type: none"> <li>- ultrasonic sensors</li> <li>- IR sensors</li> <li>- Sharp ir sensors</li> <li>- relay modules</li> <li>- power supply unit</li> </ul>	<ul style="list-style-type: none"> <li>- Sensor reading</li> <li>- Embedded system programming</li> </ul>
5	Drainage monitoring	<ul style="list-style-type: none"> <li>- micro-controller</li> <li>- servo motors</li> <li>- ultrasonic sensors</li> <li>- IR sensors</li> <li>- Flow meter</li> <li>- Overflow meter</li> <li>- Level sensors</li> <li>- Sharp ir sensors</li> <li>- relay modules</li> <li>- power supply unit</li> </ul>	<ul style="list-style-type: none"> <li>- IOT</li> <li>- RADAR</li> <li>- Sensor reading</li> <li>- Embedded system programming</li> </ul>
6	Water quality monitoring	<ul style="list-style-type: none"> <li>- micro-controller</li> <li>- servo motors</li> <li>- ultrasonic sensors</li> <li>- TDS meter</li> <li>- Ph meter</li> <li>- P10 display</li> <li>- Smps</li> <li>- relay modules</li> <li>- power supply unit</li> </ul>	<ul style="list-style-type: none"> <li>- IOT</li> <li>- RADAR</li> <li>- Sensor reading</li> <li>- Embedded system programming</li> </ul>
7	Education	<ul style="list-style-type: none"> <li>- micro-controller</li> <li>- servo motors</li> <li>- ultrasonic sensors</li> <li>- IR sensors</li> <li>- Sharp ir sensors</li> <li>- relay modules</li> <li>- power supply unit</li> </ul>	<ul style="list-style-type: none"> <li>- IOT</li> <li>- RADAR</li> <li>- Sensor reading</li> <li>- Embedded system programming</li> </ul>
8	Health	<ul style="list-style-type: none"> <li>- micro-controller</li> <li>- servo motors</li> <li>- ultrasonic sensors</li> <li>- IR sensors</li> <li>- Sharp ir sensors</li> <li>- relay modules</li> <li>- power supply unit</li> </ul>	<ul style="list-style-type: none"> <li>- IOT</li> <li>- RADAR</li> <li>- Sensor reading</li> <li>- Embedded system programming</li> </ul>
9	Transport	<ul style="list-style-type: none"> <li>- GPS (Global Positioning System) Receiver</li> <li>- GSM/GPRS/3G/4G/5G Module</li> <li>- RFID Tags</li> <li>- Microprocessor</li> <li>- Camera</li> <li>- Display Unit</li> </ul>	<ul style="list-style-type: none"> <li>- GPS Technology</li> <li>- Cellular Networks (GSM/3G/4G/5G)</li> <li>- Cloud Computing</li> <li>- Data Encryption and Security Protocols</li> </ul>

Table 1.1 all sector and its hardware and technology list:

#### IV. IMPLEMENTATION OF THE TECHNOLOGY IN PANCHAYAT

As part of a mission to digitize and empower villages, the government is trying every possible way. Or as technology is getting worse day by day, we can also implement it to overcome the niche or that is to say, from village to city. The village will be able to succeed or develop within itself, the problem of urbanization or unemployment will be enough so that there is power. Its main objective is to help in implementing the government schemes properly or using

them with transparency. It will be very easy to keep an eye on the activities by using mobile application sitting in one place.

#### V. SYSTEM ARCHITECTURE:

##### A. Admin, User and Panchayat

In this mobile or web application, admin, villagers, or Panchayat can login with their registered ID and password or can view the iot base connect village facilities from one place. It will be very easy for the government to track the work done by any village or us which will bring transparency in their work.



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