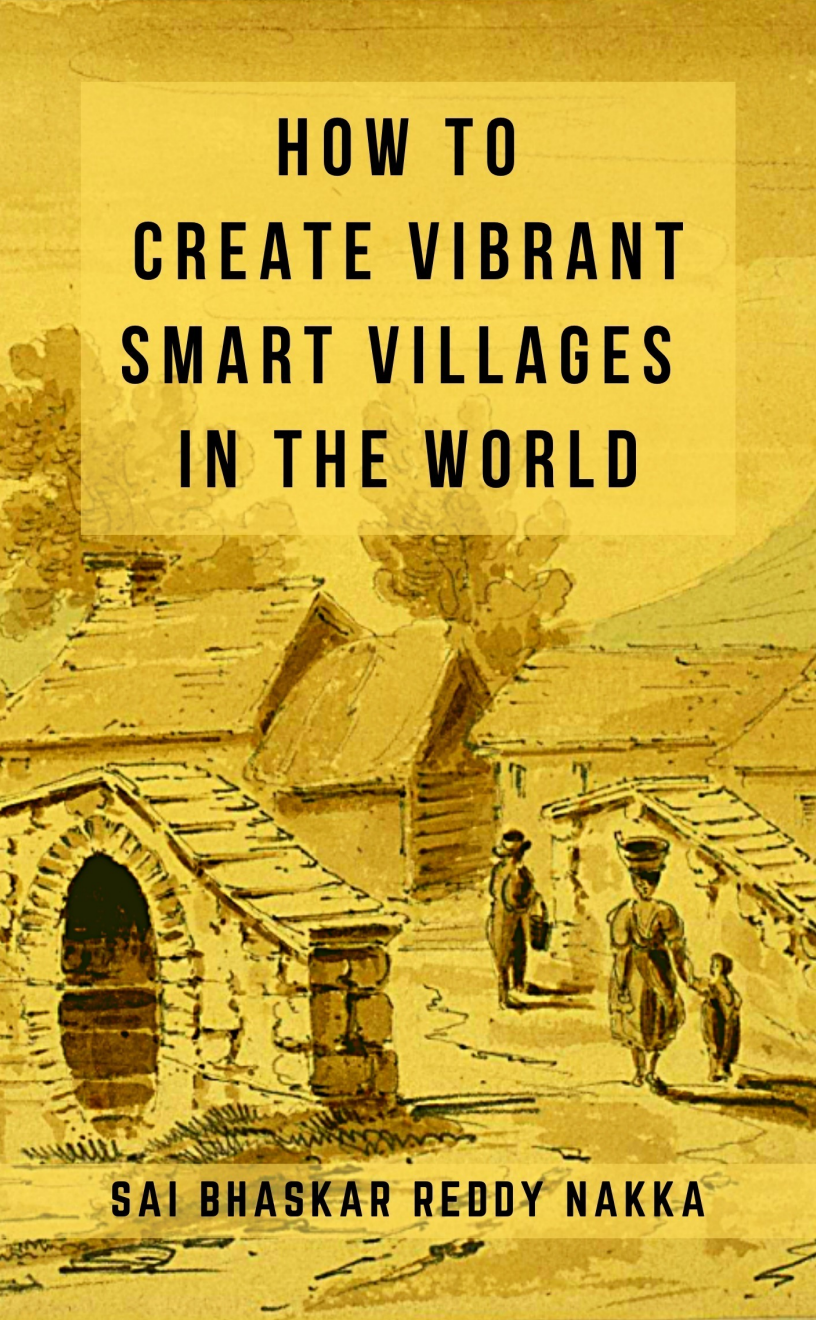
HOW TO CREATE VIBRANT SMART VILLAGES IN THE WORLD



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How to Create Vibrant Smart Villages in the World

For a Sustainable Future

This is a concept document on the issue of making villages and communities smart. All the information presented in this book is declared as Open Knowledge, except the photos and information referenced from other sources and acknowledged in the book. Contact: saibhaskarnakka@gmail.com

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Introduction

Smart village is the most decentralized system which would empower people to efficiently use various services and systems. Enable communities to address the challenges in their respective occupations and daily life. Accessing and using technologies in their respective work makes a person smart.

Farmers are the main stakeholders in the villages, who manage their livelihoods through mitigation, adaptation or through traditional sustainable practices. Several technologies developed in recent times are adopted by the farmers in rural areas.

In a smart village, people use technologies, adopt practices, do networking, use communication technologies and are innovative. The smartness will reduce the hard-work of farmers and have a better chance to reduce vulnerabilities in the present scenario.

With increased mobile smartphones usage and access to cheap broadband internet connectivity, there are many possibilities for smart monitoring and management of things. The people have access

to information and are also able to communicate across.

Especially in the farming sector, the factors and the associated uncertainties are more. The decision making is based on the controlled and uncontrolled factors. Understanding the uncontrolled factors using technologies is the smartness.

The monitoring systems are becoming cheaper and reliable. The data collected is huge. The Big-Data processing for decision making is becoming a huge task. Where the Artificial Intelligence based on the empirical data, learning models and belief systems are being developed. Although initially, the decision support systems could be discrete, over a period there is a need to integrate the systems for aggregate decision making.

> *Working hard with smartness empowers people and communities towards sustainable development.*

I

Natural

Water Management

Smart technologies for Water use efficiency

Good water management practices will increase yields, improve crop quality, conserve water, save energy, decrease fertilizer requirements, and reduce nonpoint source pollution. Information is most critical to decide on exact amount of water required by a crop in a given climatic condition and for effective design and management of irrigation system, irrigation scheduling, etc

Sensor

Sensor or transducer is defined as a device that receives energy from one system and transmit it to another, like physical variable into signal variable. Broadly defined, the sensor is a device which is capable of being actuated by energizing input from one or more transmission media and in turn generating a related signals to one or more transmission systems. It provides a usable out-

put in response to specified input measured, which may be physical or mechanical quantity, property, or conditions. The energy transmitted by these systems may be electrical, mechanical or acoustical. The nature of electrical output from the transducers depends on the basic principle involved in the design. The output may be analog, digital or frequency modulated.

It is imperative that t**he** use of smart irrigation controllers can be an **important option for** improving water use efficiency. Use of sensors would ensure using right amount of water as appropriate to season, and climate and weather conditions. And scheduling can avoid over watering and excessive runoff.

The main objective is to effectively and efficiently deliver services with usage of Information and Communication Technologies (ICTs)[11] in a minimum time. The pilot initiative whilst focusing on capacity building of various stakeholders in automatic measurement and use of real time data for decision making has research and innovation as integral elements. Other related objectives are as follows:

To apply smart technologies for monitoring water flowing through reservoir, water releases at important points of canal network and on-farm parameters;

To make use of the Information and Communication Technologies for information gathering, processing, creation of central database systems and dissemination;

To establish a Decision Support System (DSS) for data management, analysis and dissemination to various stakeholders;

To establish control systems for optimising utilisation of water with a focus on demand based and equitable water management; and

To disseminate reports required by stakeholders for water management

Initiatives on WUE

Information collected using manual measurements is less accurate; and may not represent the real time situation as can be available for further use and analysis long after its collection. There is, thus, a need for developing an error free system with less human interference using mobile technology and GIS.

The system would have sensors, instruments, gauges and devices for capturing real-time information on stage and water flows, and stage and water levels all along the water *distributory systems* from source to the field. On farm systems for monitoring the water use in the fields would give assessment on water usage by the primary stakeholders. The temperature, relative humidity sensors and soil

moisture sensors would provide information for crop management and field level activities. In other words, pilot involves developing a comprehensive system for information collection and use to help in water management decisions.

Canal Network Flow Monitoring System (CNFMS)

CNFMS is a web based system for providing water flow information in the canal network to the concerned officials . Identification of nodes in canal network for installing sensors for monitoring water flows. Collect and analyse secondary data on meteorology, soil, etc. Conducted canal and on-farm water use efficiency studies. Water levels at various nodes recorded on daily basis. Collected data from weather stations, reservoirs, and canal off take points on regular basis. Farmers and organisations are involved in collecting data on on-farm parameters. Information on weather, surface and ground water, soil and crop aspects for using down to distributaries, WUAs and TC levels

Control centre

Control centre is for centralised processing of real time information received from the various locations across the project area. Gauge stations are calibrated based on the Hydraulic Particulars of the Canal. Information is fed into DSS through online data base. Information received is processed by system; and real time data is sent to the users as SMS or graphic

images for decisions

Graphs are generated to forecast flows and trends

Decision support system (DSS)

DSS calibrates physically based, numerical models, to better understand the water systems and forecast scenarios. Software developed is used to generate and disseminate information. Information (through visuals, SMS alerts, emails, etc) is sent to designated officers, WUAs, and framers.

Information is used for decision making or responding to emergency situation; operational management of water supply; operation of gates; and satisfying agreements with neighbouring circles.

Canal control system

Canal control or hydraulic regulation describes those steps necessary to ensure the required pool water level and flow along the canal . Canal control is achieved by manipulation of the variables to obtain the desired canal system conditions. The canal control methods include, algorithms with the necessary interlinked operational steps focusing on PID controller algorithm .

Relevant studies: Canal flow data will be used to assess the conveyance losses between given points; and planning thematic studies (e.g., Changing of cropping pattern, Crop yield assessment, Water usage efficiency)

Drinking water

Monitoring the drinking water sources, storage levels in the reservoirs and monitoring the usage per family using sensors. Demand based drinking water distribution systems. Adopting to the rainwater harvesting.

Irrigation

Using sensors some of the important aspects monitored are: Soil moisture; Water level in the fields; water level in the borewells, water flows in the canals and channels, water drainage; and water quality.

The farmers could adopt the low-cost soil moisture sensors in their fields. The sensors installed at various depths would make the farmers understand the fluctuations in moisture levels. The farmers would manage the irrigation and drainage based on the information received from the sensors. Enabled by GSM the data could be received on the mobile phones too.

The RBC flumes at inlet and outlet points fitted with ultrasonic sensors will help in understanding water utilised in a field. This is for water management.

The Water Tubes fitted with ultrasonic sensors will provide information of water level even at subsurface level. They are needed especially in the paddy fields for irrigation scheduling, reducing water use through alternate wetting and drying method.

Canal automation and irrigation scheduling based

on monitoring data are other aspects need to be adopted for achieving irrigation efficiency.

To increase the irrigation potential, the solar-powered motor pumps for the bore-wells were also suggested. The remote and most deserving poorer communities could access the off-grid solar power and improve their livelihoods.