The Smart City Building Blocks & Their Synergy with Smart Villages

Invited Speech

IEEE Iran Section Webinar
25 August 2020

Professor Saifur Rahman
Director, Advanced Research Institute, Virginia Tech, USA
President, IEEE Power & Energy Society 2018 & 2019
www.srahman.org
What is a Smart City

- There is no single consensus definition of a smart city, but there is some agreement that a smart city is one in which information and communication technology (ICT) facilitates improved insight into and control over the various systems that affect the lives of residents.

A **smart city** is an urban development vision to integrate **information and communication technology** (ICT) and **Internet of Things** (IoT) technology in a secure fashion to manage a city's assets.

To be fully “smart,” a city must be “connected.”
Building Blocks of a Smart City
Cities across the world are deploying technology to gather data trying to become cleaner, reduce traffic, and improve urban life. Starting with energy management, to disaster preparedness, to public safety, to parking spot assistance, to paying bills online, to facilitate emergency vehicle movement, and much more.
Elements of a Smart City

A neighborhood in a smart city:

- A smart traffic crossing sensitive to traffic volume
- Synchronized traffic lights for smooth flow
- Emergency vehicle priority access
Optical based traffic signal preemption system for emergency and transit vehicles

Figure 12: System Architecture for J3M Opticom Emitter Detection System
Connected Transportation

- Connected vehicles and travelers will be able to share data with all sorts of equipment, and be able to procure mobility as a service, whenever wherever.
Vancouver Can Do This
Stockholm City Traffic Management

The system allows buses that are more than a minute behind schedule to automatically receive priority at traffic lights.
US Deployment: Smart Lamppost with Camera

Camera provides surveillance and locates empty parking spaces
Smart Trash Can in Baltimore, USA

Reduces the number of times a trash can needs to be emptied.
Smart Trash Can in Stockholm, Sweden

Regular trash cans need to be emptied 1–3 times per day.
Smart ones only need to be emptied four times a week.
A Building Energy Management Platform

Utility/DR Aggregator
- DR Event
- Pricing
- Billing

Encrypted Data Link
Router

Internet

Customers/Operators

Buildings

HVAC
Lighting loads
Plug loads
Sensors/power meters
Water meters
PV & storage
Security camera

Source: www.bemcontrols.com
Yokohama, Japan Smart City Demonstration
Smart Cities in India (60)
What is Normal

The New Normal

[Images of industrial factories, congested traffic, and modern sustainable practices such as solar panels and electric trains]
A smart/connected city is a system of interconnected systems including:
- Employment
- Health care
- Retail/entertainment
- Public services

The system of systems is tied together by information and communications technologies (ICT) that transmit and process data about all sorts of activities within the city.
Solar Nanogrid in Bangladesh

ICT-based power meter and bill payment using smart phones
Introducing Technology

- Enables light after sunset using solar micro-grids
- Illuminates kitchens, schools and clinics
- Lets communities live cleaner, safer, and more prosperous lives
- Stimulates local commerce and builds new enterprises
Expanding Education

- Creating a network of engineers, entrepreneurs, and practitioners
- Facilitating ongoing learning and mentorship for continued success
- Innovative Global Classroom helps people around the world access the internet and educational resources
IEEE Smart Village Success Story
Global Himalayan Expedition, India
Lingshed Monastery – Ladakh Region, Indian Himalayas – Elevation 12,000 feet.
Founded in 1440                  Illuminated with IEEE Smart Village in 2016
Global Himalayan Expedition
Villagers working with LED Lights
Loads served by roof-top Solar Photovoltaics.
Locally Driven Initiatives

Source: Grameen Shakti, Bangladesh
Ownership by Citizens

- Development of local technicians and entrepreneurs at the grass-roots level:
  To create local stakeholder for promoting, installing and providing efficient after-sales service of the technologies.

- Local capacity development and creation of green jobs:
  Local entrepreneurs, especially women are offered financial and technical assistance to set-up a renewable energy technology business.

Source: Grameen Shakti, Bangladesh
Life Changing Experience

“The customers love coming to my shop, now that I have bright light. “They can see what they are buying and what I have in stock. And they can watch television and charge mobile phones. My sales have gone up by at least 50%.”

Source: Grameen Shakti, Bangladesh
Children’s Library in a Boat with Solar-powered Light

Source: Grameen Shakti, Bangladesh
Impact of Solar PV in Rural Communities

- Education
- Healthcare
- Retail Business
- Electricity

Some of the experience from the Smart Village can show examples of social interactions which can be transferred to the Smart City and help in community building.
A connected city village is one where all relevant city village systems—utilities, transportation, employment, health care, public safety, education, and others—are capable of communicating with each other to allow coordination and reduce waste.
I would like to see a broader IEEE

We need to ensure that we are “READY FOR RECOVERY”, when we get back to the “NEW NORMAL” after COVID-19. Let us enhance cooperation, collaboration and community spirit.

For this we need to make IEEE broader so that IEEE is more relevant to the work our members do regardless where they work.

We need more participation from volunteers globally in IEEE governance. A broader based IEEE will make the Institute more relevant to technologists and academics from all parts of the world.

I would like to see more IEEE Senior Members and IEEE Fellows from Regions 8, 9 & 10

8/15/20
Prof. Saifur Rahman (s.rahman@ieee.org)

Past-President of IEEE Power & Energy Society
Past-Chair, IEEE Publication Services & Products Board

PES accomplishments:
- PES University
- PES Corporate Engagement Program
- PES Chapters’ Councils in China, India, Africa and Latin America

website: [https://www.srahman.org](https://www.srahman.org)