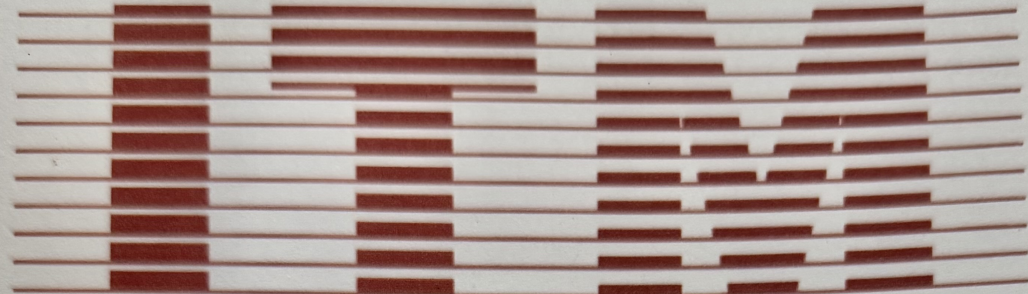


PBL Report on:

SMART CITY CONCEPT & COMPONENTS



UNIVERSITY
GWALIOR • MP • INDIA

Submitted to:

Dr. Rakesh Gupta.

(Associate Professor)

Student Name:

Abdoul Marouf (BETN1CE23004) *Abdoul Marouf*

Khushi (BETN1CE23001) *Khushi*

Class: 3rd year

Smart cities (CEE 0604)

School of Engineering & Technology

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CERTIFICATE

This is to certify that the PBL report entitled “**Study of Smart City Concept and Components**” submitted by **Abdoul Marouf** and **Khushi** student of **B.Tech Civil Engineering, ITM University Gwalior**, is a genuine project work carried out under guidance for academic purposes.

ACKNOWLEDGEMENT

I express my sincere gratitude to my professor and the department of Civil Engineering at ITM University Gwalior for providing the opportunity to carry out this PBL project on **Smart City Concept and Components**.

I also thank my classmates and friends for their support and valuable suggestions during the preparation of this project. Special appreciation goes to the authors and researchers whose works on smart city technologies helped me understand this modern urban development concept.

ABSTRACT

Rapid urbanization has created serious challenges such as traffic congestion, environmental pollution, inefficient energy use, and lack of sustainable infrastructure. The concept of **Smart Cities** has emerged as a modern solution to improve the quality of life for citizens using **Information and Communication Technology (ICT), Internet of Things (IoT), Big Data, and intelligent infrastructure systems.**

This project studies the **concept, objectives, components, benefits, and challenges of smart cities.** Major components such as **smart governance, smart mobility, smart environment, smart living, smart economy, and smart people** are discussed in detail. The project also includes a **case study of a Smart Bedroom,** demonstrating how smart home technology enables control of lighting and speakers using voice commands.

The study concludes that smart cities are essential for sustainable urban development and efficient management of resources.

Table of Contents

CERTIFICATE	3
ACKNOWLEDGEMENT	4
ABSTRACT	5
INTRODUCTION TO SMART CITIES.....	8
NEED FOR SMART CITIES	10
<i>1 Population Growth</i>	<i>10</i>
<i>2 Traffic Congestion.....</i>	<i>10</i>
<i>3 Environmental Pollution</i>	<i>10</i>
<i>4 Resource Management.....</i>	<i>10</i>
OBJECTIVES OF SMART CITIES.....	11
EVOLUTION OF SMART CITIES.....	12
<i>Phase 1 – Traditional Cities.....</i>	<i>12</i>
<i>Phase 2 – Digital Cities.....</i>	<i>12</i>
<i>Phase 3 – Smart Cities</i>	<i>12</i>
CHARACTERISTICS OF SMART CITIES.....	13
<i>Smart Economy.....</i>	<i>13</i>
<i>Smart Governance.....</i>	<i>13</i>
<i>Smart Mobility.....</i>	<i>13</i>
<i>Smart Environment</i>	<i>13</i>
<i>Smart Living.....</i>	<i>13</i>
COMPONENTS OF SMART CITIES.....	15
COMPONENTS OF SMART CITIES.....	17
SMART GOVERNANCE.....	18
SMART MOBILITY.....	19
STATION OF SMART BICYCLE FOR CITIZEN.....	22
SMART ENERGY MANAGEMENT	23
SMART WATER MANAGEMENT.....	25
SMART WASTE MANAGEMENT	26
SMART HEALTHCARE.....	27
SMART EDUCATION	28
SMART ENVIRONMENT	29
SMART SECURITY AND SURVEILLANCE.....	30
SMART INFRASTRUCTURE.....	31
INTERNET OF THINGS IN SMART CITIES.....	32
ARTIFICIAL INTELLIGENCE IN SMART CITIES	33

BIG DATA AND CLOUD COMPUTING.....	34
SMART TRANSPORTATION SYSTEMS	35
SMART BUILDINGS AND HOMES.....	36
SMART STREET LIGHTING	37
GLOBAL EXAMPLES OF SMART CITIES.....	38
SMART CITY MISSION IN INDIA	40
COMPONENTS	43
• SMART SPEAKER • SMART LIGHTS • WI-FI NETWORK • VOICE ASSISTANT SOFTWARE	43
WORKING	43
EXAMPLE COMMANDS	43
SCAN HERE TO SEE THE DEMONSTRATION VIDEO OF MY SMART BEDROOM.....	46
ADVANTAGES AND CHALLENGES	47
FUTURE SCOPE OF SMART CITIES.....	48
CONCLUSION	51
REFERENCES	52

Introduction to Smart Cities

A **Smart City** is an urban area that uses advanced technologies such as **ICT, IoT, and data analytics** to improve infrastructure, public services, and quality of life.

According to researchers, a smart city integrates:

- Physical infrastructure
- Digital technology
- Social systems
- Economic systems

to achieve efficient and sustainable urban development.

Smart cities aim to make urban life:

- More efficient
- Environmentally sustainable
- Technologically advanced
- Citizen-friendly

The concept emerged due to rapid population growth and increasing demand for urban services.

Smart City Technology Ecosystem



Need for Smart Cities

Urban population is growing rapidly worldwide. It is estimated that **70% of the global population will live in cities by 2050.**

There are several reasons why smart cities are necessary.

1 Population Growth

Urban populations are increasing rapidly, putting pressure on city infrastructure.

2 Traffic Congestion

Traditional transportation systems are not efficient enough to manage increasing vehicles.

3 Environmental Pollution

Industrialization and transportation cause pollution problems.

4 Resource Management

Cities must manage energy, water, and waste more efficiently.

Smart city technologies help solve these issues through **automation, monitoring, and data analysis.**

Objectives of Smart Cities

The main objectives include:

1. Improve quality of life
2. Efficient resource management
3. Sustainable urban development
4. Smart infrastructure development
5. Digital governance
6. Better transportation systems
7. Energy efficiency
8. Environmental protection

Evolution of Smart Cities

Cities have evolved from traditional settlements to technology-driven urban ecosystems.

Phase 1 – Traditional Cities

Basic infrastructure with manual systems.

Phase 2 – Digital Cities

Introduction of internet and communication technologies.

Phase 3 – Smart Cities

Integration of IoT, AI, and data analytics.

Characteristics of smart cities

A smart city has several unique characteristics.

Smart Economy

Promotes innovation and digital businesses.

Smart Governance

Digital government services improve transparency.

Smart Mobility

Efficient transportation systems reduce congestion.

Smart Environment

Use of green technologies and pollution monitoring.

Smart Living

Better healthcare, housing, and public services.

ISO 37120

Indicators Indicators Standards Framework Diagram



Components of smart cities

Smart cities consist of various interconnected components.

Component	Description
Smart Governance	Digital government services
Smart Mobility	Intelligent transport systems
Smart Environment	Environmental monitoring
Smart Living	Healthcare and housing
Smart Economy	Innovation and entrepreneurship
Smart People	Skilled and educated citizens



Components of Smart Cities

Major smart city components include:

1. Smart Governance
2. Smart Mobility
3. Smart Environment
4. Smart Living
5. Smart Economy
6. Smart People

Additional technological components:

- Smart infrastructure
- Smart buildings
- Smart transportation
- Smart energy
- Smart healthcare
- Smart technology

Smart Governance

Smart governance involves using digital technology to improve government services.

Examples:

- Online public services
- Digital payments
- E-governance portals
- Online complaint systems

Benefits:

- Transparency
- Faster services
- Reduced corruption
- Improved citizen participation

Smart governance uses digital platforms for delivering government services efficiently.

Examples include e-governance portals, digital identity systems, online public services, and citizen feedback systems.

Smart Mobility

Smart mobility focuses on **efficient transportation systems**.

Examples:

- Intelligent traffic systems
- GPS-based public transport
- Electric vehicles
- Smart parking systems

Benefits:

- Reduced traffic congestion
- Reduced pollution
- Faster transportation
- Improved safety

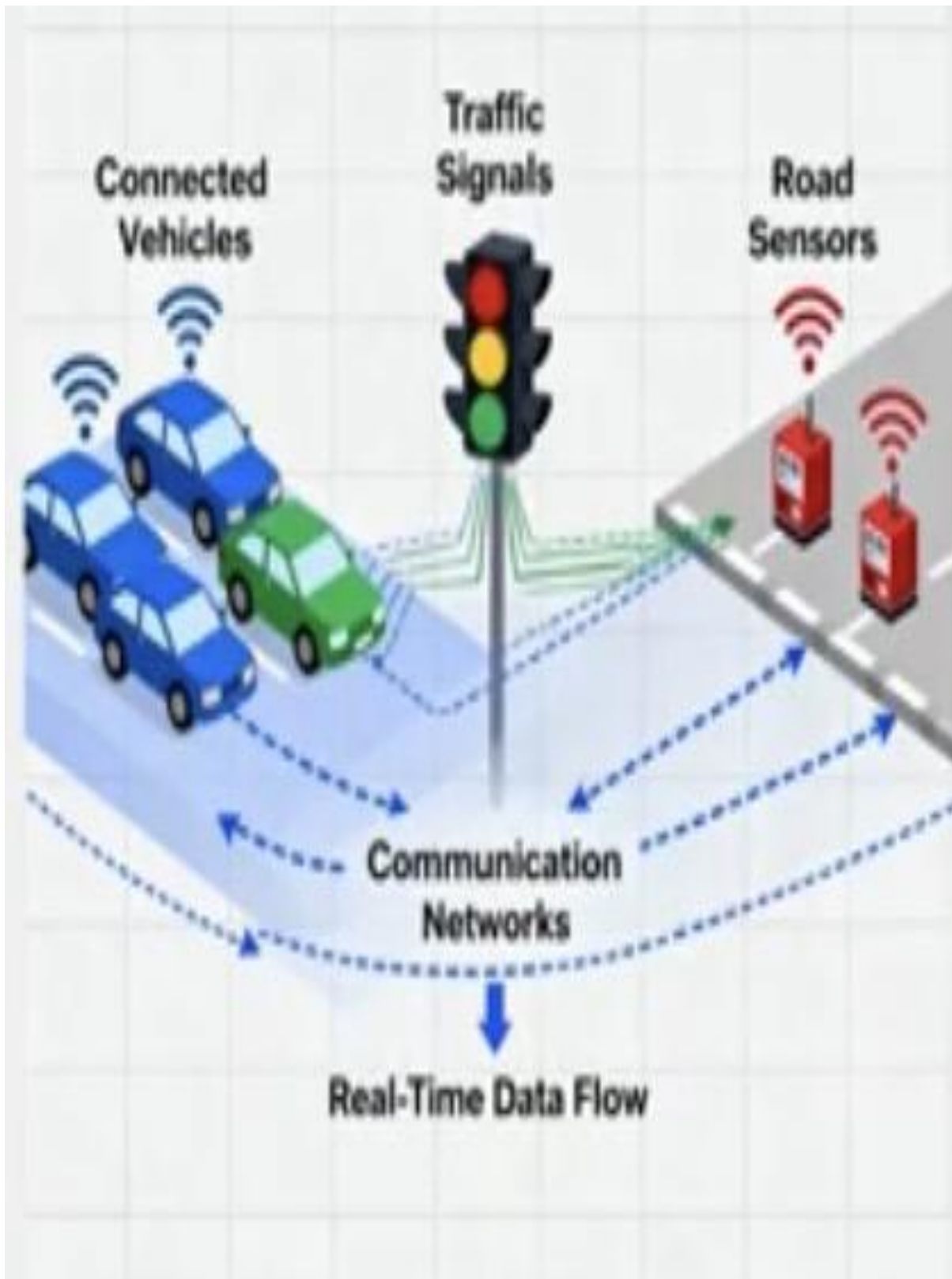
Smart mobility focuses on efficient transportation systems such as intelligent traffic lights, GPS-based vehicle tracking, smart parking systems, and electric vehicle infrastructure.

Smart mobility focuses on improving transportation systems.

Examples:

- Smart traffic lights
- Intelligent traffic monitoring
- Smart parking systems
- Electric vehicle infrastructure

Benefits include **reduced traffic congestion and lower emissions**.





Electric vehicle for city mobility Delhi



Station of smart bicycle for citizen

Smart Energy Management

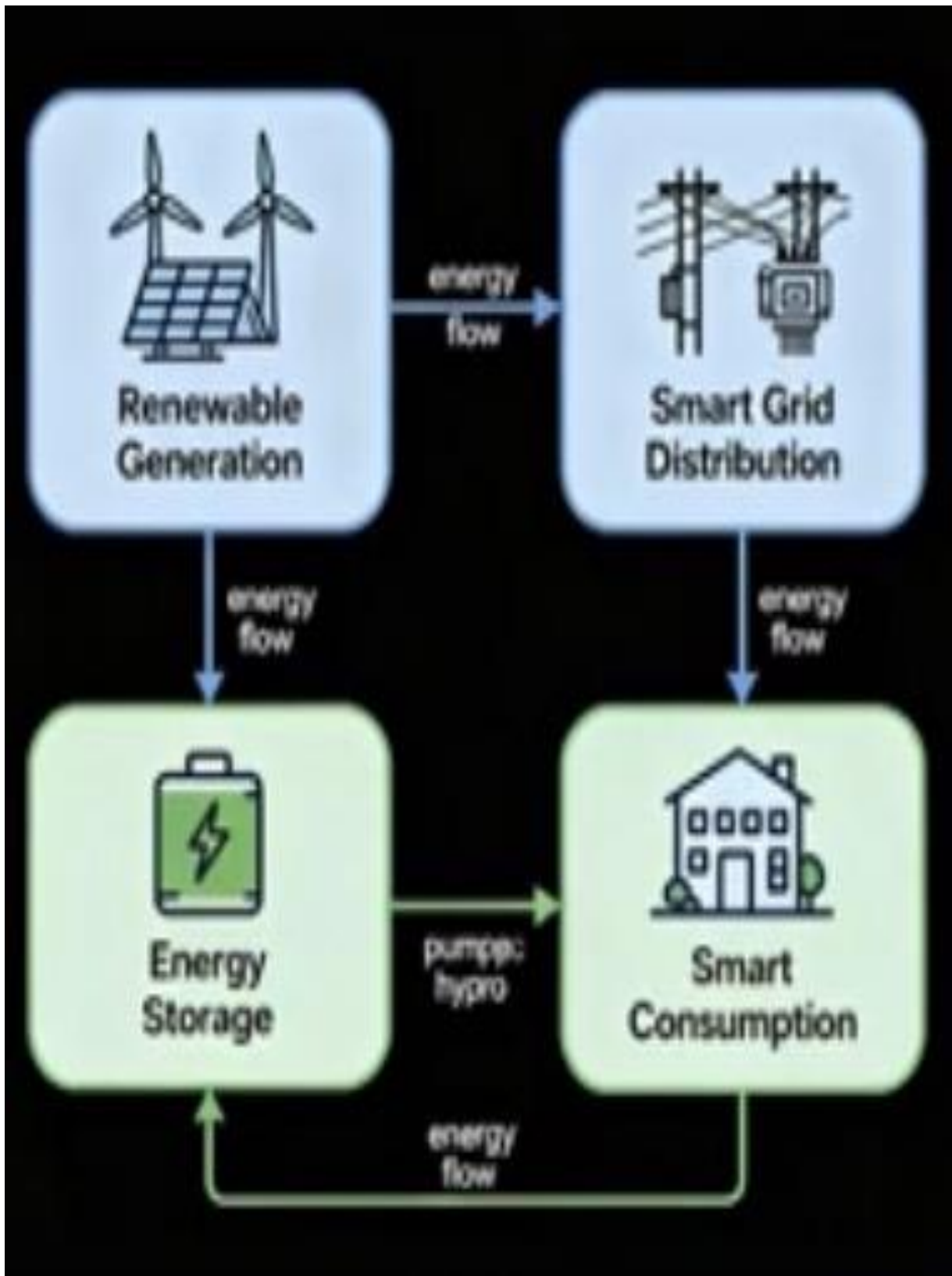
Smart cities use advanced energy systems.

Examples include:

- Smart grids
- Renewable energy sources
- Energy monitoring systems
- Smart meters

These systems improve energy efficiency.

Energy systems in smart cities use smart grids, renewable energy sources, and smart meters to monitor electricity usage and optimize energy distribution.



Smart Water Management

Water management systems use sensors and digital monitoring.

Features include:

- Leak detection systems
- Smart water meters
- Automated distribution systems
- Water quality monitoring

Water management technologies include smart water meters, automated distribution networks, leak detection systems, and water quality monitoring.

Smart Waste Management

Smart waste systems use sensors in waste bins to monitor fill levels.

Advantages include:

- Efficient waste collection
- Reduced pollution
- Better recycling processes

Smart bins equipped with sensors notify waste management authorities when they are full.

This improves waste collection efficiency and reduces environmental pollution.

Smart Healthcare

Smart healthcare systems improve medical services using technology.

Examples:

- Telemedicine
- Electronic health records
- Wearable health monitoring devices

Smart healthcare uses telemedicine, digital medical records, wearable health devices, and AI-based diagnostic tools to improve medical services.

Smart Education

Education systems are becoming digital.

Features include:

- Online learning platforms
- Smart classrooms
- Virtual laboratories

Smart education systems include digital classrooms, e-learning platforms, virtual labs, and online education resources.

Smart Environment

Smart cities use environmental monitoring systems.

Examples include:

- Air quality sensors
- Smart irrigation systems
- Renewable energy technologies

Environmental monitoring systems track air quality, noise levels, and weather conditions to protect natural resources.

Smart Security and Surveillance

Public safety is enhanced using digital surveillance systems.

Technologies include:

- CCTV cameras
- Facial recognition systems
- Emergency alert systems

Advanced surveillance technologies such as CCTV cameras, facial recognition, and emergency response systems improve public safety.

Smart Infrastructure

Infrastructure includes buildings, roads, and public facilities integrated with digital technologies.

Examples:

- Smart buildings
- Smart transportation networks
- Smart utilities

Smart infrastructure integrates digital technologies with roads, buildings, utilities, and public services to enhance efficiency.

Internet of Things in Smart Cities

IoT connects devices through the internet.

Examples in smart cities:

- Traffic sensors
- Smart meters
- Environmental monitoring devices

IoT connects devices such as sensors, cameras, and smart meters through the internet.

These devices collect data and help manage city operations efficiently.

Artificial Intelligence in Smart Cities

AI analyzes large amounts of data to improve city management.

Applications include:

- Traffic prediction
- Crime analysis
- Energy optimization

AI systems analyze large amounts of urban data to improve decision making in transportation, energy management, and public safety.

Big Data and Cloud Computing

Big data helps analyze information collected from sensors and devices.

Benefits:

- Better decision making
- Efficient resource management

Big data analytics and cloud platforms help store and process large amounts of information collected from smart city systems.

Smart Transportation Systems

Smart transportation systems use technology to improve travel efficiency.

Examples:

- GPS tracking
- Intelligent traffic lights
- Smart parking systems

Transportation systems use real-time traffic monitoring, smart traffic lights, and navigation systems to reduce congestion.

Smart Buildings and Homes

Smart buildings use automation systems to control lighting, heating, and security.

Benefits include:

- Energy efficiency
- Improved comfort
- Automated control systems

Smart buildings use automation systems to control lighting, temperature, security systems, and electronic appliances.

Smart Street Lighting

Smart lighting systems automatically adjust brightness using sensors.

Benefits:

- Energy savings
- Reduced maintenance costs

Street lights with motion sensors automatically adjust brightness to save energy and reduce operational costs.

Global Examples of Smart Cities

Examples include:

- Singapore
- Barcelona
- Amsterdam

These cities use advanced technologies to manage urban services efficiently.

These cities use advanced technologies to manage transportation, energy systems, and urban infrastructure.

Evolution of Global Smart City Frameworks



1st Generation:
Digital Infrastructure
(2000-2010)

Focus: Basic digital connectivity
(IoT sensors, data platforms)



2nd Generation:
Integrated Systems
(2010-2020)

Focus: Cross-sector integration
(smart grids, traffic management)



3rd Generation:
Human-Centric Ecosystems
(2020-Present)

Focus: Equity and sustainability
(citizen engagement, green tech)

Smart City Mission in India

The Government of India launched the **Smart Cities Mission** to develop 100 smart cities.

Objectives:

- Sustainable infrastructure
- Smart governance
- Improved urban services

Examples:

- Pune
- Indore
- Bhopal
- Surat

The Government of India launched the Smart Cities Mission to develop 100 smart cities with improved infrastructure and sustainable development.

Smart City Mission India Launch 2015

Ministry of Housing
and Urban Affairs



Infrastructure Development

Smart City Mission City Selection Framework Evaluation Criteria & Points Distribution Assessment Process



Smart City Mission
Build green, efficient, and people-oriented smart cities

Three Models for Comprehensive Urban Development: Retrofitting Existing Areas with Pan-City Solutions

Sustainable Renewal Model



- Key Features:
- Energy-efficient upgrades, green
- space expansion

Smart Integration Model



- Key Features:
- Digital infrastructure integration,
- smart governance

Community-Centric Model



- Key Features:
- Public space enhancement,
- community participation,

Case Study: My Smart Bedroom

My smart bedroom uses **voice-controlled automation** to control electronic devices.

Components

- **Smart speaker**
- **Smart lights**
- **Wi-Fi network**
- **Voice assistant software**

Working

1. The user gives a voice command.
2. The smart speaker processes the command.
3. The command is sent through Wi-Fi.
4. The smart device executes the action.

Example Commands

- “Turn on the lights”
- “Play music”
- “Turn off lights”

This system improves **comfort and energy efficiency**. My smart bedroom uses voice commands to control devices such as lights and speakers.

Components:

- Smart speaker
- Smart light bulbs
- Wi-Fi router
- Voice assistant software

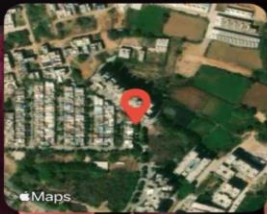
Working:

The user gives a voice command. The smart speaker processes the command and sends a signal through the internet to the connected devices.





 GPS Map Camera



Gwalior, Madhya Pradesh, India 

Sai Baba Mandir Road, Elixir City Township, Gwalior, Madhya Pradesh 474011, India

Lat 26.192602, Long 78.213905

Saturday, 07/03/2026 02:05 PM GMT+05:30

Note : Captured by GPS Map Camera



[Scan here to see the demonstration video of my smart bedroom](#)

Advantages and Challenges

Advantages:

- Improved urban efficiency
- Better infrastructure management
- Energy conservation

Challenges:

- High implementation costs
- Cybersecurity risks
- Privacy concerns.

Future Scope of Smart Cities

Future smart cities will use advanced technologies such as:

- Artificial Intelligence
- 5G communication
- Autonomous vehicles
- Smart robotics

2025-2030

Next Phase Priorities Roadmap



2030 Future Roadmap Vision



Digital
Service Delivery



Universal
Access



Carbon
Neutrality



Innovation
Leadership



Innovation
Leadership



Quality of
Life

Conclusion

Smart cities represent the future of urban development. By integrating advanced technologies with infrastructure, cities can become more sustainable, efficient, and livable.

The case study of the smart bedroom demonstrates how smart technologies can improve daily life at the individual level.

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