Smart Cities in India: Role of technology in urban planning

Presented at **National Short-Term Program on "Future Smart Cities" at PDEU**

September 2025

Center for Water and Sanitation (CWAS) CRDF, CEPT University

CWAS CENTER FOR WATER AND SANITATION | CRDF CEPT RESEARCH AND DEVELOPMENT FOUNDATION | CEPT UNIVERSITY

About CWAS at CRDF CEPT University

CEPT University's core focus is human habitat. Through its education, research and advisory activities, it strives to improve the impact of habitat professions in enriching the lives of people in India's villages, towns and cities.

CEPT Research and Development Foundation (CRDF) has been established by the University to manage their research and capacity building activities. There are nine domain-focused centers in the CRDF. The Center for Water and Sanitation (CWAS) is among the first center to be established.

CWAS began its work in 2009 with focus on improving water and sanitation services in India. It carries out activities related to action research and capacity building – working closely with city and state governments, enabling them to improve delivery of services.

About CWAS – Approach and areas of work

Core values

Public Goods Mindset

Action-oriented Research and Innovation

Government Engagement at All Levels

Learning Culture and Academic Roots

Working At scale

Thematic areas of work

MONITORING WASH SERVICES

From Infrastructure creation to Service Delivery

Data driven decision making for improved service delivery

ACTION RESEARCH FOR SANITATION

Sanitation services in small and medium towns that are sustainable, inclusive and equitable

Action research from cities be scaled up at the state and national level

GOVERNANCE AND FINANCING

Strengthening municipal finance and governance, planning and financing urban WASH

WATER SECURITY

Water Governance, management and climate resilience

Water supply service delivery and managing water resources

GENDER INCLUSION AND EQUITY IN SERVICES

Gender inclusion urban WASH

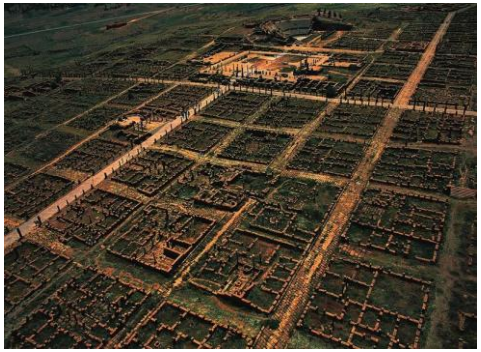
Ensuring sustainable and equitable access to safe water and sanitation at scale

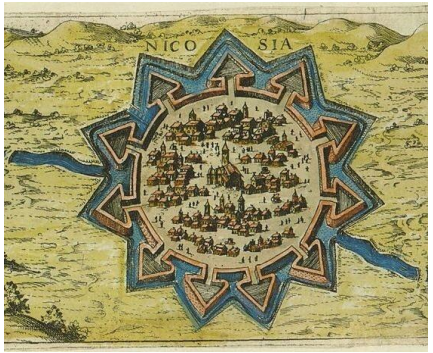
CLIMATE CHANGE

Energy Transition in WASH services

Mitigation and Adaptation measures for WASH

Technology has shaped urban planning for centuries





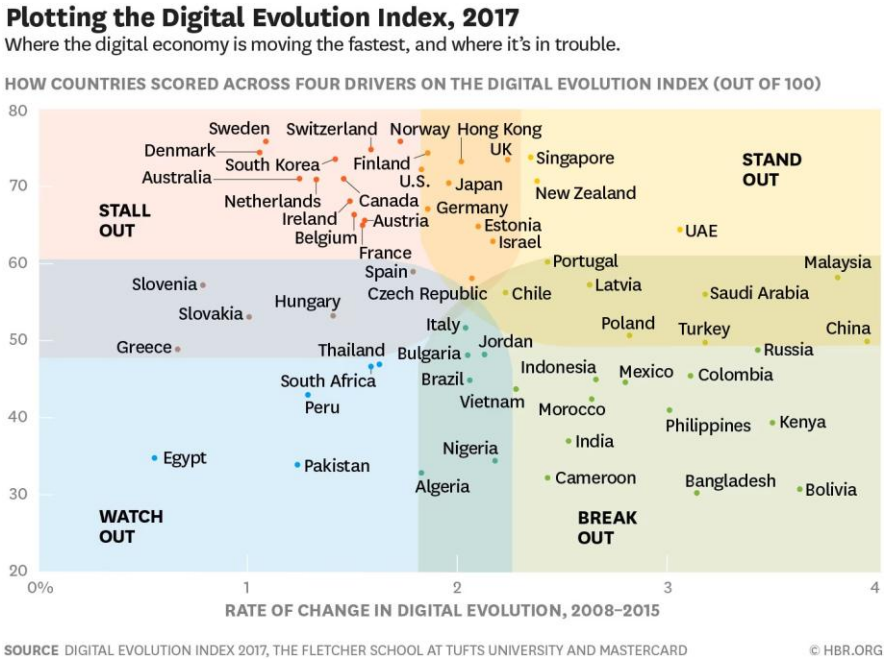
Mohenjo-daro grid and drain technology

Roman Timgad and advanced road technology for military discipline - chariots, carts, marching soldiers

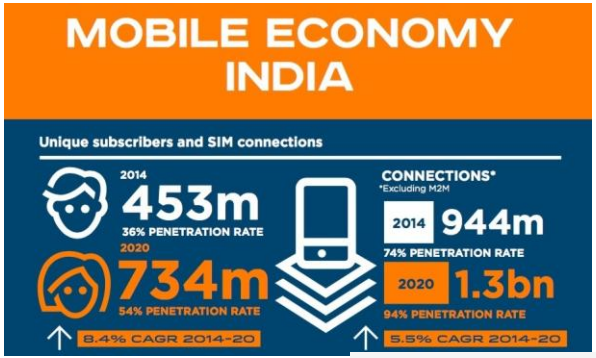
Aqueducts bringing water from far away – enabling Rome to become a sprawling metropolis

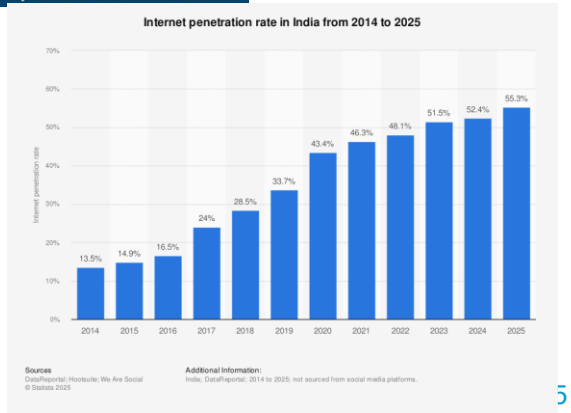
Invention of gunpowder influencing design of forts

Technology in India is growing at a very fast pace



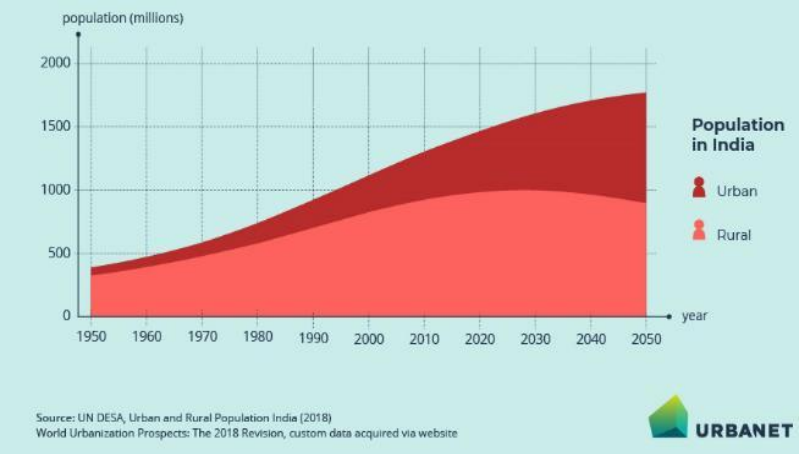
Mobiles and internet penetration have enabled this





India is becoming more and more urban

Around 2030, the rural population is expected to decline while the urban population rises rapidly



What is the role of technology in this modern age of urban planning?

What are the urban problems technology needs to solve today?

Need for innovation to solve modern urban challenges and achieve sustainable development

Urban Challenges

- Traffic Congestion & Mobility
- Housing Shortage & Informal Settlements
- Unchecked Urban Expansion & Lack of Planning
- Governance & Financial Constraints
- Lack of Inclusivity & Biased Development
- Ecological Neglect Incomplete Solutions

The **Sustainable Development Goals (SDGs)** are a set of **17 global goals** adopted by all United Nations member states as part of the **2030 Agenda for Sustainable Development**. They serve as a "shared blueprint" to achieve a better and more sustainable future for all, addressing the world's most urgent challenges.

India's National Missions oriented towards these issues

स्वच्छ भारत
एक कदम स्वच्छता की ओर

अमृत
Atal Mission for Rejuvenation and Urban Transformation

LiFE
Lifestyle For Environment

Har Ghar Jal
Jal Jeevan Mission

PMAY
PRADHAN MANTRI AWAAS YOJANA

Smart City
MISSION TRANSFORM-NATION

नमामि गंगे

Digital India
Power To Empower

National Urban Livelihoods Mission

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Smart Cities Mission in India

Smart City
MISSION TRANSFORM NATION

Ministry of Housing and Urban Affairs
Government of India

Launched by PM Narendra Modi in **2015**, it sought to transform 100 Indian cities into smart, sustainable, and citizen-friendly urban centers through a competitive "Smart City Challenge."

- **Ministry of Housing and Urban Affairs (MoHUA)** oversees its implementation.

Funding & Financial Mechanism

- **Centrally Sponsored** ₹48,000 crore over **5 years** (₹100 crore/city/year).
- States/Urban Local Bodies (ULBs) **must match** central funding.
- **Additional Financing** via bonds, **Finance Commission** grants, govt schemes, borrowings & **PPPs.**

A smart city leverages tech and data to enhance services, sustainability, and quality of life while driving economic growth.

Smart Environment
- Green buildings
- Green Energy
- Green urban planning

Smart Economy
- Local and global interconnectedness
- Productivity
- Entrepreneurship & innovation

Smart people
- 21st century education
- Inclusive Society
- Embrace creativity

Smart government
- Enabling supply & demand size policy
- Transparency & open data
- ICT & eGOV

Smart Living
- Culturally vibrant
- Safe & happy
- Healthy

Smart Mobility
- Mixed-modal access
- Integrated ICT
- Clean & non-motorized option

What is a Smart City?

- No universal definition !
- SMART cities in India is an **urban renewal and retrofitting programme focusing on** livability, sustainability, economic growth
- Leverage tech and data to enhance services, sustainability, quality of life and economic growth
- Four pillars: Institutional (governance), Physical (infrastructure), Social (quality of life), Economic (competitiveness)

https://www.ibef.org/government-schemes/smart-cities-mission
https://www.india.gov.in/spotlight/smart-cities-mission-step-towards-smart-india
https://currentaffairs.adda247.com/smart-cities-mission-in-india-objectives-principles-and-characteristics/

Smart Cities Mission in India

Mission Objectives :

- **Provide Core infrastructure**: water, electricity, sanitation, mobility, housing, IT/digitalization, governance, environment, safety, health, and education.
- **Area-based development**: strategies include **retrofitting**, **redevelopment**, and **greenfield development**, alongside **pan-city smart solutions**.
- Promote **sustainable financing** through co-funding, PPPs, municipal bonds, Pooled Finance Development Fund, and the National Investment and Infrastructure Fund

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Implementation

100 Smart Cities chosen via **competitive federalism**.

Implemented via city-level **SPVs** with **50:50** state/UT & ULB equity.

Initial duration **2015-2020** (extended till **31st March 2025**).

Three Area-Based Models Development
Retrofitting (improvement), **Redevelopment** (renewal), **Greenfield** (expansion).

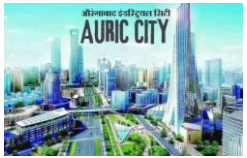
Pan City-Initiative At least **one smart solution** applied city-wide.

Integrated Command and Control Centres ICCCs set up in all cities for real-time urban service monitoring.

How did Indian cities leverage this mission?

Vijayawada – Golden Mile Project

Smart street prototype: includes **free Wi-Fi**, **smart lighting**, **smart parking**, **kiosks**, **surveillance**, and a city digital platform.



Aurangabad Industrial City (AURIC)

Greenfield smart industrial city under DMIC, inaugurated in **September 2019**, integrating plug-and-play infrastructure across 10,000 acres.

Palava City (Maharashtra)

Planned township spanning ~5,000 acres, focused on sustainability, walkability, green infrastructure, and net-zero ambitions—model urban development.

New Town, Kolkata

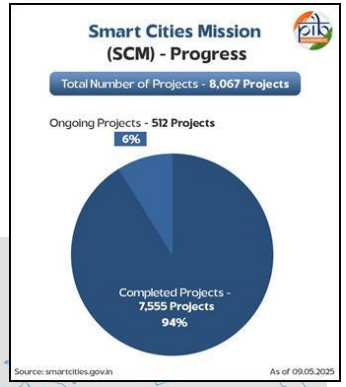
Evolved from marshland into a sustainable, IT-driven smart satellite city with green buildings and advanced mobility—smart status since **2017**.

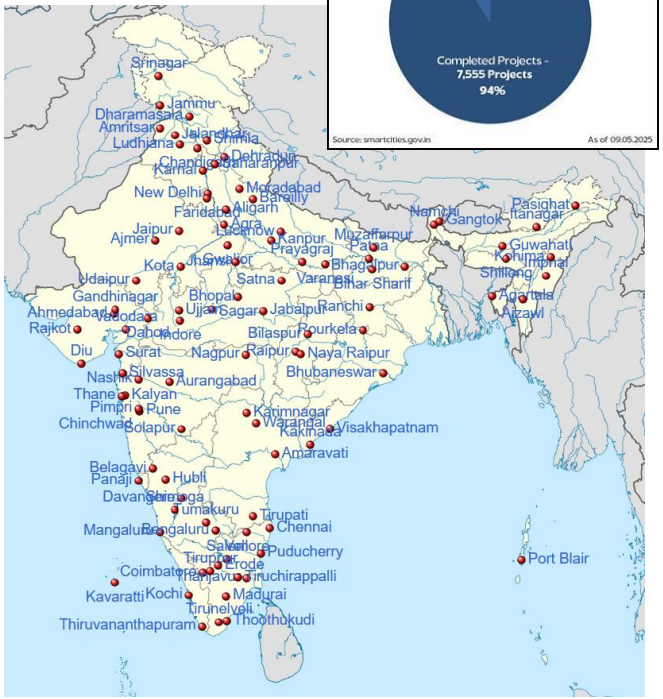
Indore – Riverfront Development

Rejuvenation of Kanh and Saraswati rivers through a 3.9 km riverfront redevelopment under the mission's objectives.

Bhopal – Quality of life

BRTS reduced travel time, Water supply: 125 LPCD, Uninterrupted power supply





A range of digital innovations applied

SMART MOBILITY SYSTEMS

- Intelligent Traffic Management Systems (ITMS), use 4i a signal timing and congestion
- GPS-based tracking for buses
- Automatic Number Plate Recognition rearıors parknesз
- e-ticketing for public transport
- Smart parking

E-GOVERNANCE & CITIZEN SERVICES

- Digital platforms enable grievance redressal, utility payments and mobile feedback

SMART WATER UTILITIES

- SCADA systems monitor and manage water pipelines and treatment plants
- Smart meters for real-time usage data and leak reduction

PUBLIC SAFETY & SURVEILLANCE

- CCTV networks
- Emergency call systems
- Safety audits
- AI-supported video crime mo-nitoring

WASTE MANAGEMENT TECH

- Smart bins with RFID e roıute optimization
- GPS-tracked garbage trucks
- IoT-enabled tracking to enforce waste segregation
- Waste to-energy, compost and liel

SUSTAINABLE ENERGY

Solar panel installations

LED street lighting

Green buildings

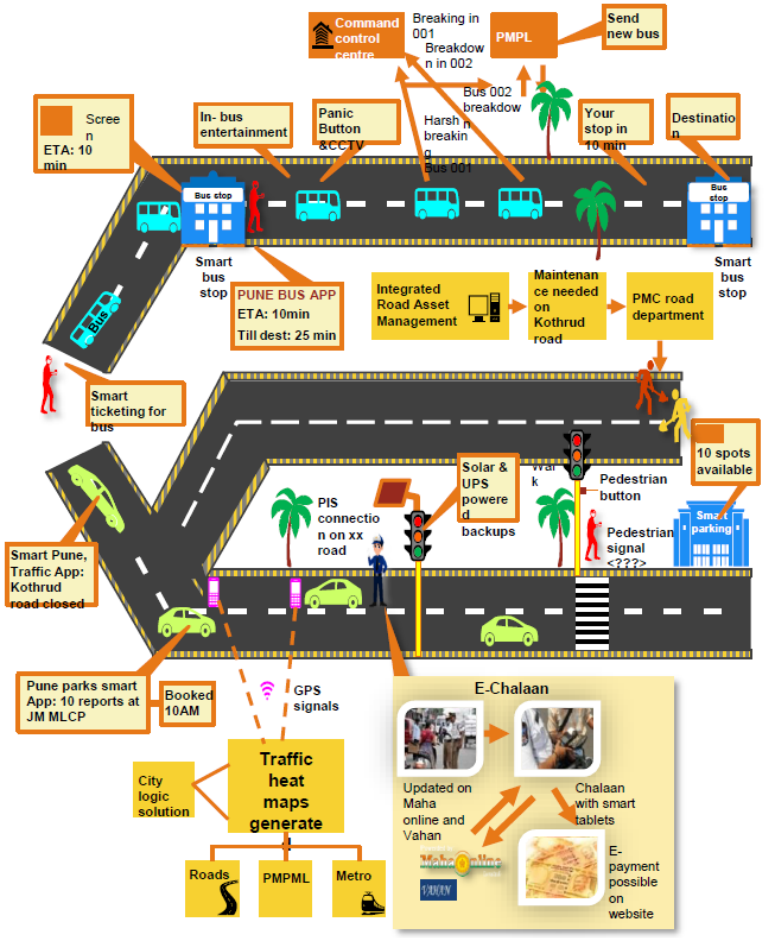
ENVIRONMENTAL MONITORING & RESILIENCE

- Sensors for air/water quality measurement
- LiDAR-based **3D digital twins** for flood risks and emergency planning.
- AI & satellite tools map urban heat vulnerability at granular levels.

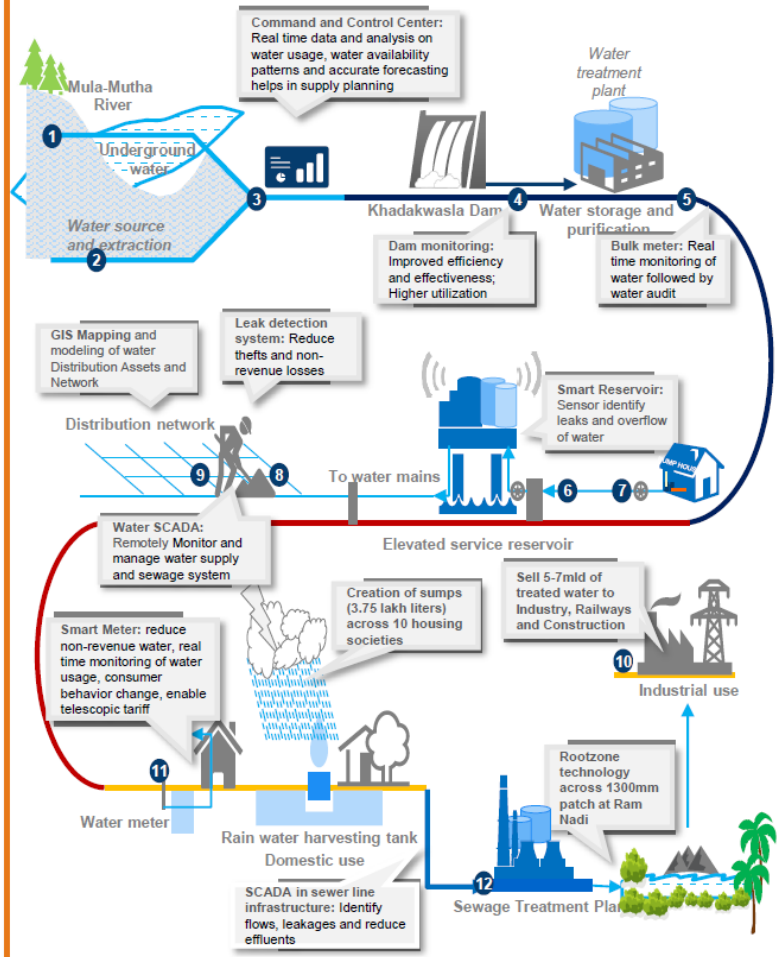
https://en.wikipedia.org/wiki/Safetipin
https://pubadmin.institute/urban-local-governance/smart-cities-transforming-urban-india
https://en.wikipedia.org/wiki/Chennai_Smart_City

Pune – "best pitch" in the Smart City Challenge - pan city applications

Transport



Water



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Role of AI – The future of SMART cities is not simple tech!

Urban issues are well known ▶ IoT devices and information systems are established and increasingly applied ▶ “Agentic AI” is needed!

A real-life example …

Your SMART fridge detects through its camera that bread is running low

▶

It knows –
- Your preferred e-market and brands
- Your purchase history

It analysis –
- Based on your purchase history, you will run out of bread in 2 days
- Optimum delivery times based on your schedule
- Best prices

▶

It orders bread for you in the background and it arrives right on time at your doorstep

- Without any action on your end

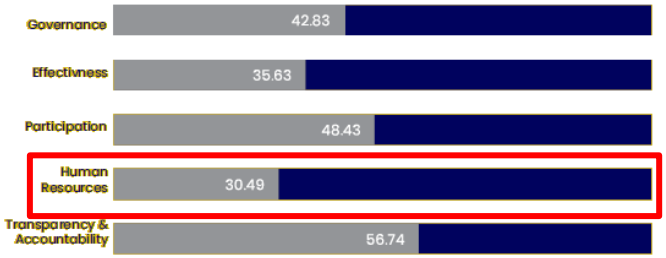
Role of AI – The future of SMART cities is not simple tech!

Urban issues are well known ▶ IoT devices and information systems are established and increasingly applied ▶ "Agentic AI" is needed!

Scale and variability of problems is huge!

Need to move away from human touch in some aspects!

Human resource limited



Source: Municipal Performance Index, 2020 by MoHUA, Institute of Competitiveness, Aatmnirbhar Bharat. National Average of Governance Sectors https://smartcities.gov.in/sites/default/files/2023-07/MoHUA%20Municipal%20Performance%20Index%20MPI%202020.pdf

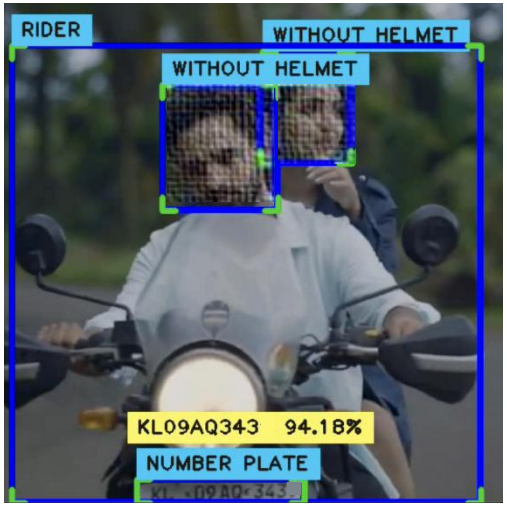
Constant monitoring is required to improve existing urban services

Some problems are decision intensive and human resource intensive – segregation?

There is a need to go from "firefighting mode" to "predictive management"

Most common use of AI by SMART cities - Mobility and Urban transport

- Ahmedabad, Jabalpur, Nagpur, PCMC, Ranchi, Tumakuru, Vishakhapatnam etc.
- Use of computer visioning for traffic management
- Automatic number plate recognition and challan issuing
- Enforcing traffic rules by automatic detection of
  - over-speeding
  - no seat-belt
  - no helmet
  - wrong way
  - illegal parking etc.
- Additionally, systems for better traffic management – assessing average wait time at signal and improving signaling system



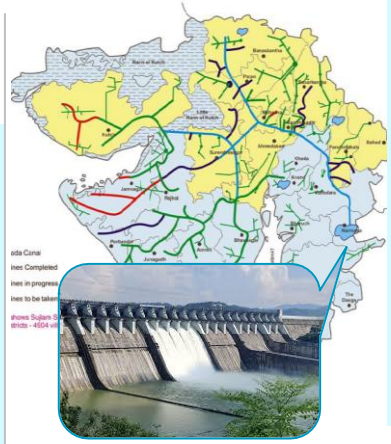
Water sector – Source sustainability

Many of our Indian cities depend on groundwater.
Overextraction is an issue leading to “Day Zero” like conditions

Bangalore - AI for groundwater?

Public borewells being upgraded with **AI and IoT sensors -**

- Monitor **flow patterns** and water levels
- Automatically **regulate pump operations**, including **shutdowns** when levels fall
- Prevent over-extraction and equipment damage.



Kachchh and groundwater

Cities in Gujarat now increasingly dependent on Narmada water - brought from 100s of kms away

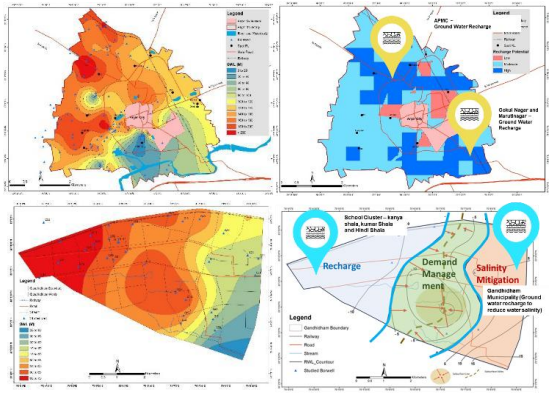
Many are reportedly unable to manage the bills for bulk water purchase

Can they once again be self-reliant on their own groundwater sources?

Initiatives like “catch the rain” now promoting rainwater harvesting and ground water recharge

But such practices at city-scale require technical and extensive geo-hydrological studies

CWAS research and projects in Gandhidham and Anjar demonstrated geo-hydrology informed rainwater harvesting and groundwater recharge



Can GIS, AI and remote sensing enable this?

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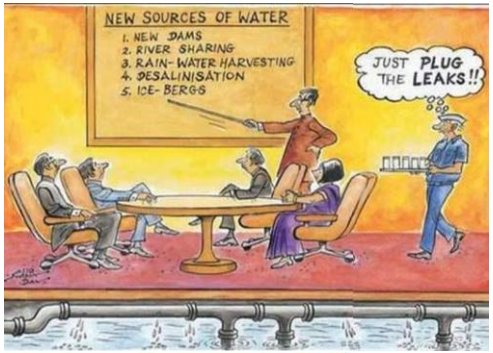
Water sector – Municipal supply efficiency

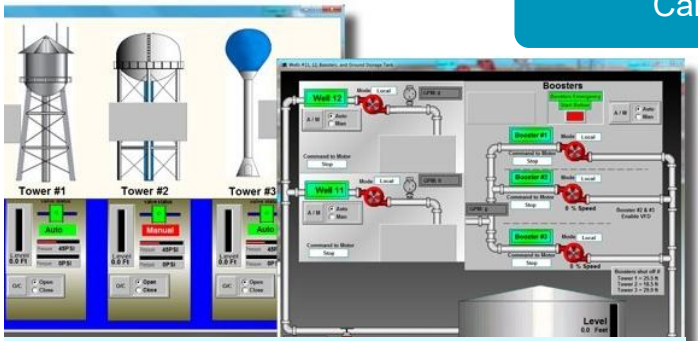


- While Indian cities extract millions of litres of water daily, they are still not able to provide the minimum 135 litres per capita per day benchmark to their citizens
- 24 X 7 water supply a distant dream … they are often not able to supply water daily – water once every few days!
- Moreover, in most cities over 40% of supply water does not generate revenue or cover the cost of supplying it!
- Reduction of NRW or Non-Revenue Water is an important component of national flagship missions

Leakages

Theft

Can data analytics and AI help optimize water supply?



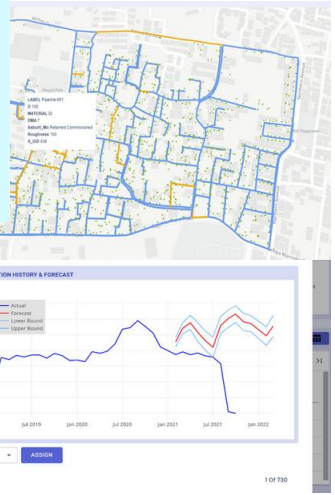
SCADA Systems (Supervisory Control and Data Acquisition) installed by many SMART cities but often data not used to take decisions by waterworks departments due to limited knowledge!

SCADA often not available end-to-end – source to distribution terminals – which is where the most leakage happens!

Real time water losses monitoring system on transmission lines in Rajkot to monitor and reduce water losses.

SmartTerra: NRW reduction – Indonesia

- Detect water loss even in intermittent supply
- Abnormal meter reading detection



Need to improve data systems first!

In India, no metering
Only ~3% urban water connections with functional meters

Water sector – data system strengthening to enable last mile connectivity – “har ghar nal se jal”

Linking identity proofs has streamlined banking and income tax.

Such innovation also needs to enter the urban planning and governance domain

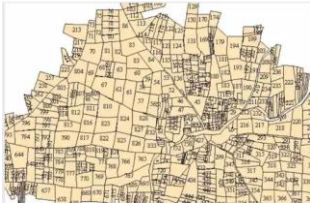
AMRUT 2.0
Making Cities Water Secure

- The AMRUT mission has enabled “infrastructure networks” to reach to vulnerable areas, though household connections have not been provided to all
- Many vulnerable areas still rely on access to water through illegal connection, standposts, tanker supply
- A CWAS study* noted that cities are improving “affordability” of getting connections, but legal and administrative barriers remain.

Prove identity
↓
Address proof
↓
Prove house ownership
↓
Building permission - NOC
↓
Prove connection to drainage
↓
Submit application
↓
Get tap connection

Can technology help synchronize public databases to enable smoother e-services?

Land revenue records



Property tax records

Building permit and layout records

Other utility connection records

Aadhar and PAN

* Source: CWAS (2023), Last Mile Connectivity for Urban Water Supply Services : A study done for Ministry of Housing and Urban Affairs (MoHUA). Available at: https://cwas.org.in/resources/file_manager/Last%20mile%20connectivity%20for%20urban%20water%20supply%20services.pdf

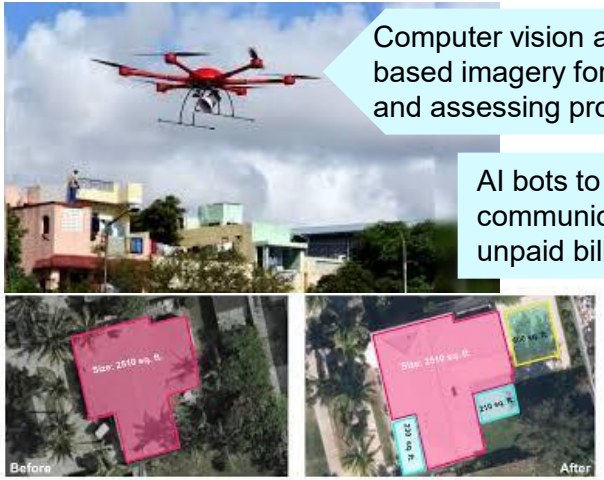
Enhancing property tax - major source of revenue for cities

Figure 16: **Property Tax as a Percentage of GDP in Select Countries**

Sources: For India 2017-18: Ahluwalia et al. (2019), p. 9; for Organisation for Economic Co-operation and Development (OECD) and developing countries in the 2000s: Bahl and Martinez (2007), Table 1, p. 16; and for 18 OECD and 29 developing countries, based on International Monetary Fund Government Finance Statistics, various years.

- Poor level of property tax mobilization in India
- Does not reflect market values – reassessment exercises are time consuming and infrequent
- Billing efficiency – Often property tax billing covers only **63–80%** of eligible properties
- Collection costs are very high – arrears and exemption schemes

Can AI help enhance reassessment and improve collections?



Computer vision and drone-based imagery for geo-tagging and assessing properties

AI bots to automate communications for unpaid bill

MCG & MCM now take AI route to boost property tax collection

Vishakha Chaman / Aug 07, 2025, 04:00 IST

Gurgaon: MCG and MCM have introduced artificial intelligence (AI) to boost revenue from property tax. MCG has so far generated a revenue of Rs 200 crore, which is around 72% of its target set for FY26, and MCM's has already crossed the Rs 29 crore-mark, the revenue it generated in the last fiscal year.

Using AI, residents with outstanding dues are being identified and approached and their queries resolved. AI also assists them in paying their property tax dues.

"We are using AI to boost our property tax collection. We have so far collected a

"We took the data of self-certified properties with the highest dues and used generative AI, which is a bot, to call the owners.
This bot answers in real time. If you did not pay property tax, it will ask you what difficulties you faced and subsequently address your concerns. Before reaching out to people, we segregated the data into categories of those who promised to pay or refused to pay the taxes and those who faced difficulties in paying them. Most of the people contacted ended up paying the taxes"

Use of AI for improving E-Governance system

29 PUNE
AI boosting efficiency in Property Tax Assessment

29.1 Problem Identification

Pune Municipal Corporation identified a challenge to sort out the discrepancies in the collection of property tax and identification of the unassessed properties within the corporation area. The main idea is to achieve continuous improvement in property tax database and to develop a process that optimizes tasks automatically without human intervention.

29.2 Role of AI in Solution

AI technology-based Property revenue/tax assessment is an introductory initiative and is unique to the problem statement of PMC. Reduces failures caused by human limitations. The geo-tagged properties database which is updated every 6 months is fed into AI based engine, where the discrepancies (properties leakages) are identified basis which the team inspects such properties on ground.

Key Highlights of the implementation

- Finds out the leakages in property tax collection.

29.3 Implementation Process

Deployment of SI was done through RFP. The bidder who demonstrated better functionality of Machine Learning (ML) and the different ML techniques such as Deep Learning (DL) was qualified for implementing the solution.

Support Ecosystem
SI - M/s. La Mere Business Private Ltd,
Consultant- Ernst and Young LLP,
Municipal teams – IT Department PMC, Property Tax Department, PMC.

Tech Providers:
Fluent Grid

Scale of Deployment

- At present, the solution is deployed at PMC Jurisdiction, initially started with 2 wards of PMC.

26 BENGALURU
Adopting AI to enhance Law enforcements services

26.1 Problem Identification

To register multiple department grievances, citizens need to various departments or websites or dial various numbers. Chatbot facilitates Data dissemination and Grievance redressal from a single platform, without human intervention.

26.2 Role of AI in Solution

By using AI technology, the following services would be facilitated.

- Multi department grievance registered and pushed to the respective department for redressal.
- Status of the complaints of various departments which are integrated into this system, can be fetched from this platform.

Key Highlights of the implementation

- Accurate Chatbot functionality has been integrated into Bengaluru Smart City Web Portal. Deployment into Bengaluru Smart City mobile app and Open Data Portal is underway.
- A citizen can either get information or register a grievance and get it redressed without human intervention.

26.3 Implementation Process

The project was implemented through RFP process and it was for full deployment without any POC.

Support Ecosystem
Azure, Bengaluru smart city Ltd. (BenSCL).
Infrastructure Development Corporation (Karnataka). iDeck

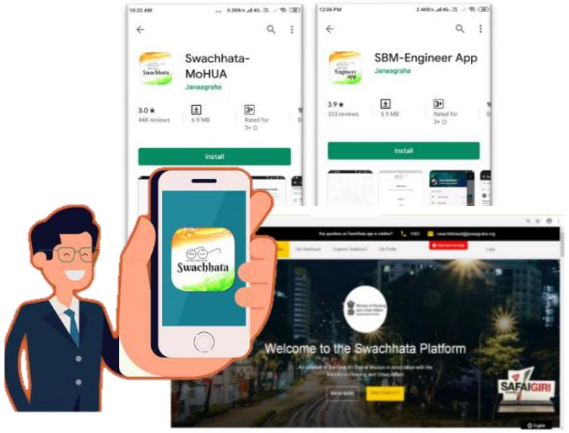
Tech Providers:
Fluent Grid

Scale of Deployment

- At present deployed as Web portal,

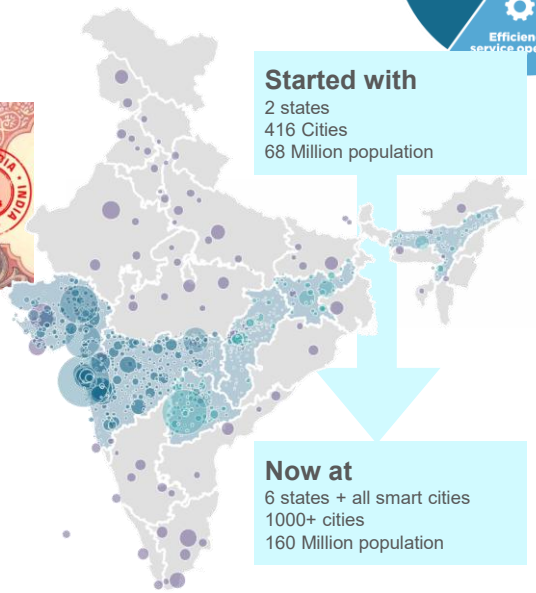
- Integrated grievance redressal system in Bengaluru
- Easy integration and access to all complaints by all the departments
- Chatbot functionality has been integrated into Bengaluru Smart City Web Portal for remotely accessing complaints and knowing its status
- Pune- Finds out the leakages in property tax collection.

MoHUA's Swachhata app for streamlining complaint redressal system



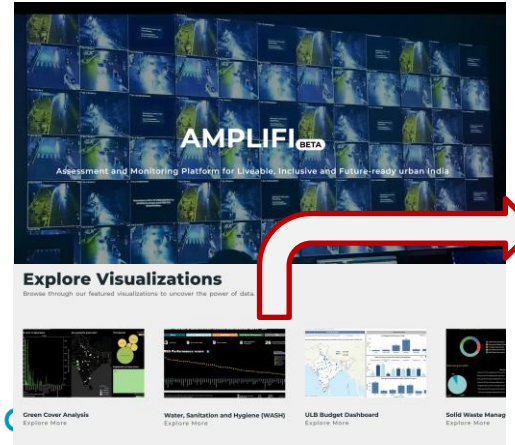
Performance Assessment System at CWAS – tech platform enabling cities to assess their services and access central govt funds

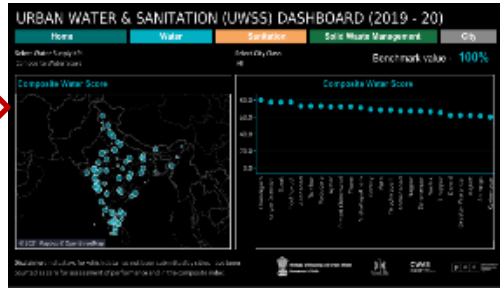
- Measure and monitor performance of water and sanitation services by urban local governments
- Online self-assessment portal – filled by city officials annually
- Various validation checks and calculation to generate “Service Level Benchmarks”
- SLBs published by state governments for cities to avail central grants – 13th / 14th / 15th Finance commission
- Data driven governance – Dashboards enabling informed decisions for improvement actions
- Dashboard integrated in SMART cities AMPLIFI portal



Started with
2 states
416 Cities
68 Million population

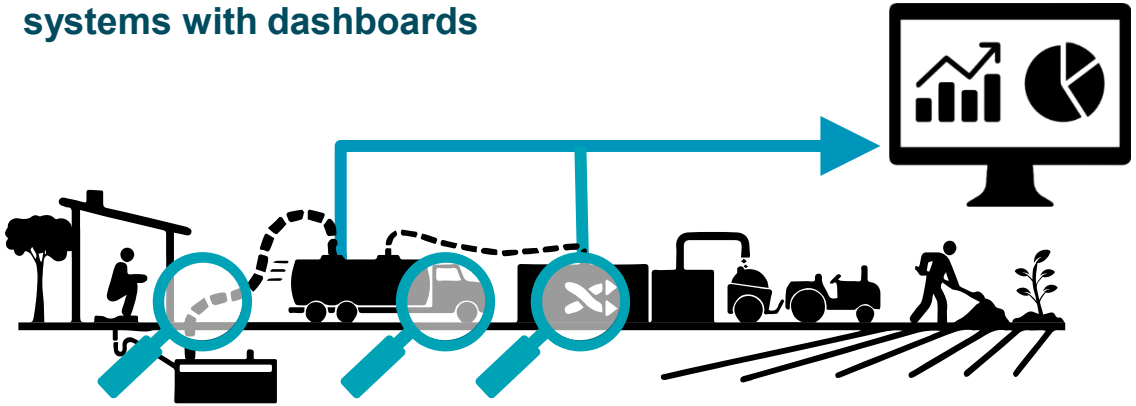
Now at
6 states + all smart cities
1000+ cities
160 Million population





Digital monitoring for effective service delivery

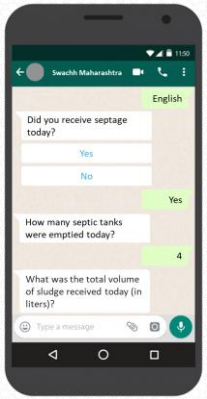
Use of monitoring systems across sanitation service chain – digital systems with dashboards



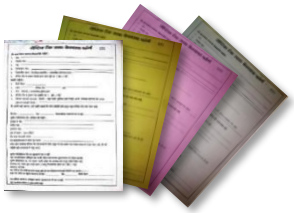
Tech need not be pan-city services – sometime even process based

Eg: Digitizing traditional logbooks used in municipal services and surveys-

Chatbot for tracking efficiency and load received at treatment plants

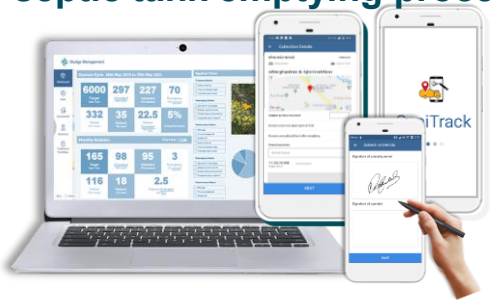


FROM Paper based – TO digital systems



SaniTab – for sanitation surveys

SaniTrack – for monitoring septic tank emptying process



More information: SaniTab SaniTrack - Digital Monitoring Systems for FSSM

Solid waste and sanitation – tackling garbage segregation

- Indian cities generate ~160,000 tonnes of municipal solid waste every day.
- Most goes to dumpsites, which are already overflowing.
- Segregation helps divert 60–70% of waste away from landfills
- However, segregation is very human resource intensive
- Moreover, door to door collection is also very capital intensive, human resource and infrastructure intensive – a large amount of waste remains uncollected in cities

How are cities leveraging AI and robotics for segregation?

Sharjah

BEEAH Launches Recycling Facility wi... Robotics & AI to reinforce Zero Waste to Landfill Ambitions

BACK TO ARTICLES

...automatically detect, identify and separate different types

Computer vision - Combining AI, Camera inputs and robots to automate waste segregation - achieving 76% waste diversion rate

Illawarra, Australia,

Household waste trapped in plastic bin bags makes segregation difficult

A pre-trained dataset curated from historical records of the recycling company Remondis uses camera footage directly from trucks to detect plastic bags in collected waste

Solid waste and sanitation – garbage collection efficiency

23 VISAKHAPATNAM
Creating a Healthy Metropolis using AI

23.1 Problem Identification

Solid Waste has been a major concern in Visakhapatnam city. Due to the vast area of the city, monitoring the garbage collection from each and every bin was a herculean task. The officials of GVSCCL aimed to create "A Resilient and Healthy Metropolis for People" by addressing the problem.

23.2 Role of AI in Solution

To address the problem identified, IOT sensor-based semi-underground bins were installed across the ABD area with volumetric sensors. These sensors are used to detect the level of waste in the bin. Waste collection monitoring by using RFID tags for compactor bins and GPS for the garbage weighing machines. Smart Bin Utilization to monitor the waste generated.

The bins are integrated into the COC application. Once the volume reaches above 90%, the garbage vehicle will be notified. The bin will be collected within SLA ensuring that there is no garbage overflow.

- Combining IoT and AI
- IoT to sense 90% full bin
- AI to optimize collection route – dynamic route allocation
- Efficiency – reduce unnecessary trips

22 VARANASI
Efforts to make the city cleaner using AI

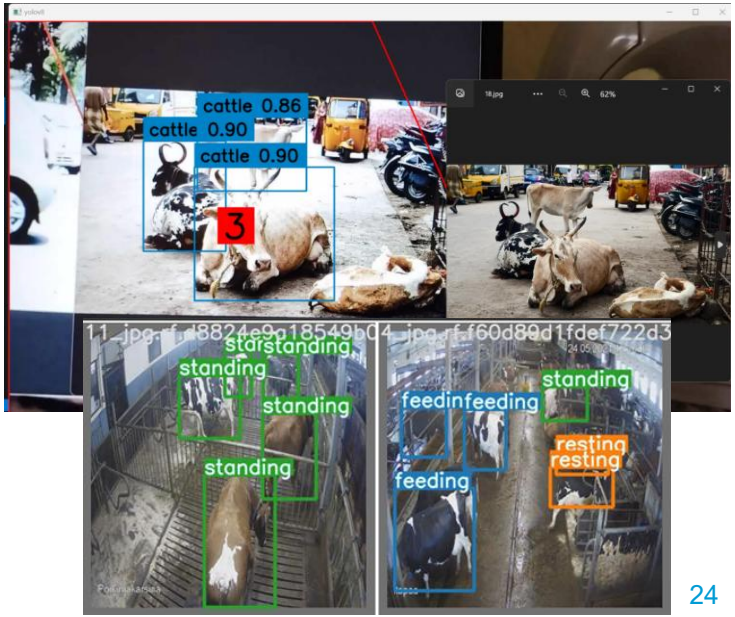
22.1 Problem Identification

To make any city cleaner, at first, the pressing issue of Solid Waste is to be dealt. Varanasi with a focus to make its city cleaner has planned for better monitoring and management of Solid waste and littering and to have better control over the spaces.

- CCTV cameras and computer vision
- Littering detection and full bin detection through cameras
- Alerts to authorities through SMS / email

In a different domain - Surat

Surat is exploring AI with CCTV for cattle management on road. The technology uses COMPUTER VISION to detect cattle as well as their behavior and body language. It is popularly used in large farms in USA.



Sewers and storm water drain maintenance

“Manhole” to “Machine hole” - Can AI help mitigate manual scavenging?

Stormharvester Intelligent sewer suite - Wessex, UK

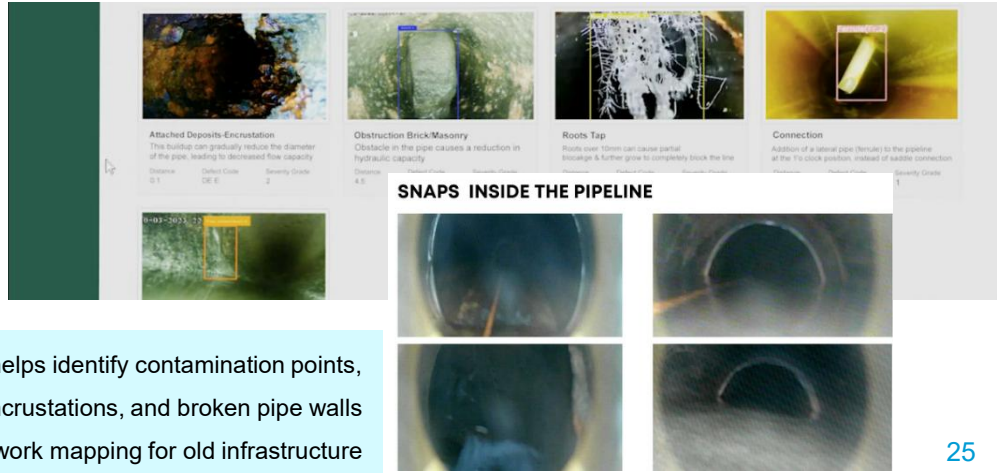
- IoT sensors under access covers and at outlets
- Alerts about blockages and potential pollutants
- Anomaly detection

SMS: Near real-time predictions and alerts

Bandicoot robot – Kerala

- Equipped with human-like arms and a range of gas sensors to identify and assess sewage conditions inside drainage chambers
- Machine Vision: It uses machine vision technology for operators to see inside manholes, even in low-light conditions.

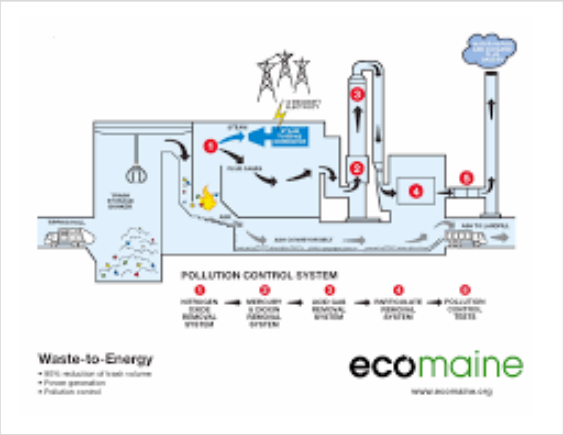
Endobot robot and Swasth AI – Chennai, Goa



- Crawls inside the water pipelines in the area and helps identify contamination points, cracks, leaks, encrustations, and broken pipe walls
- Inclination calculations / network mapping for old infrastructure

Optimizing treatment facilities – predictive maintenance

Toronto - AI for optimizing treatment facilities



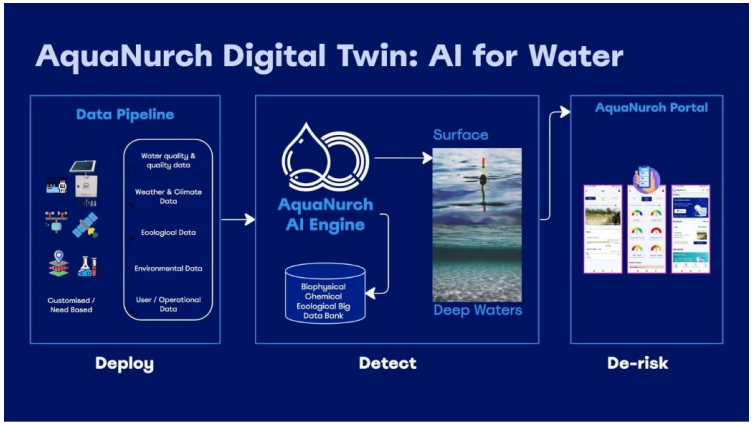
- AI models can predict chemical dosing requirements in treatment plants based on influent quality data.
- AI can optimize aeration systems in STPs to reduce energy consumption.
- Integration of AI-driven models to enhance process efficiency and to maximize biogas yield from waste in Singapore.

AI for healthy water bodies

Clearbot robot – Hong Kong & Meghalaya

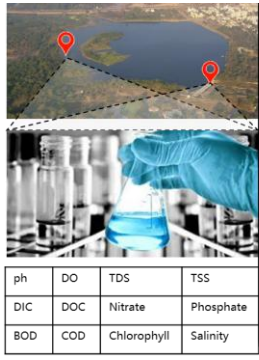
- Lake cleaning and pollution detection-trash, water hyacinth
- Autonomous – swim on its own
- One robot is able to collect a metric ton of trash a day
- Computer vision - “We generate data about what’s in the water, what’s the make-up of the stuff that’s there, how much of it is recyclable and what materials we should be focusing on.”

AquaNurch digital twin models for water bodies

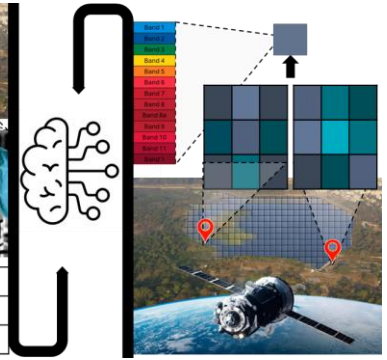


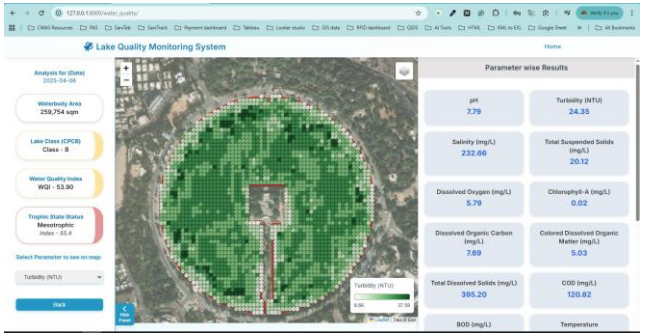
- Weather and climate data + water quality data from sensors to maintain health of water body for improving fish farming / ecological restoration

CWAS research – Machine learning to estimate lake water quality using satellite imagery



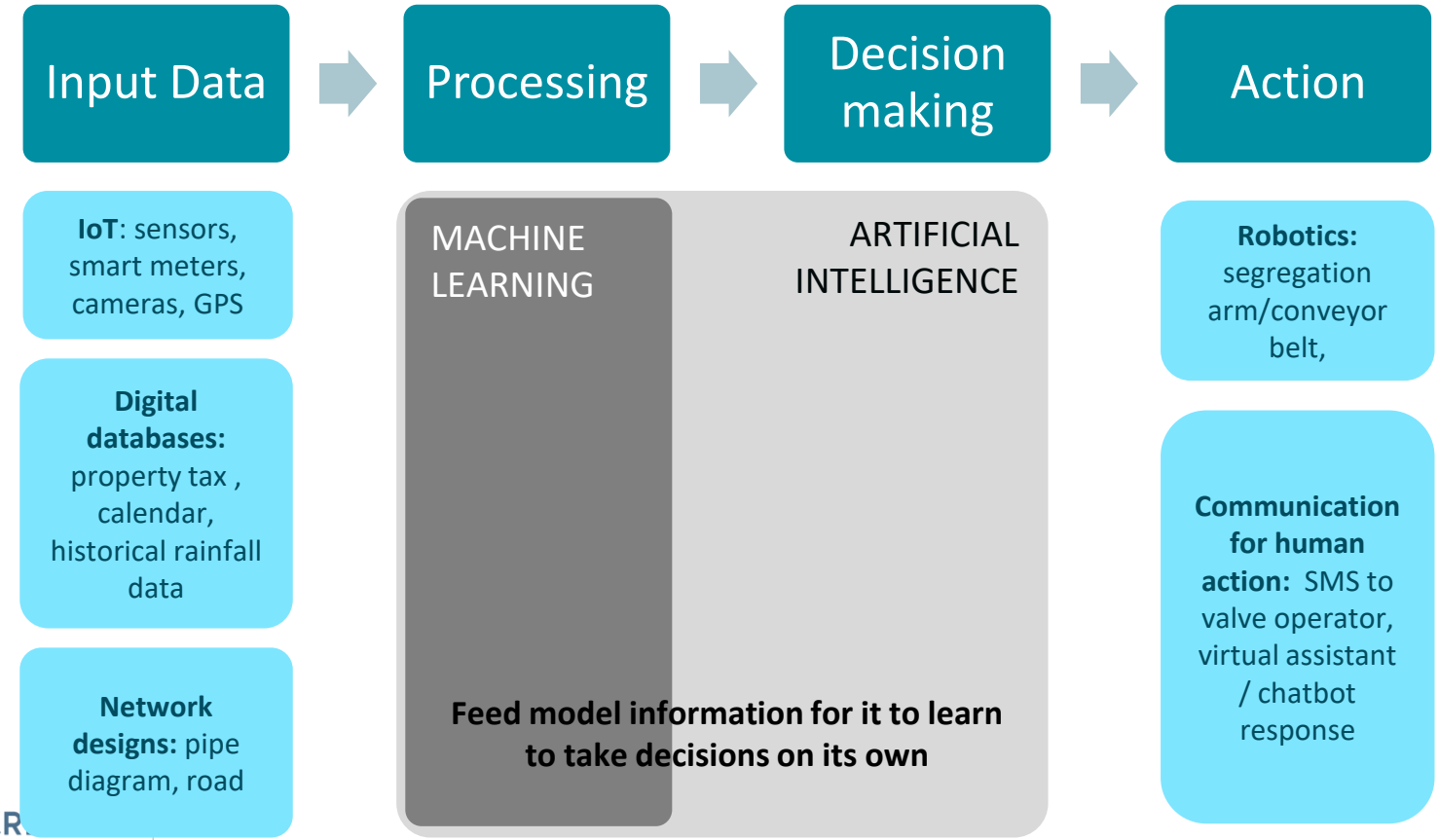
ph	DO	TDS	TSS
DIC	DOC	Nitrate	Phosphate
BOD	COD	Chlorophyll	Salinity



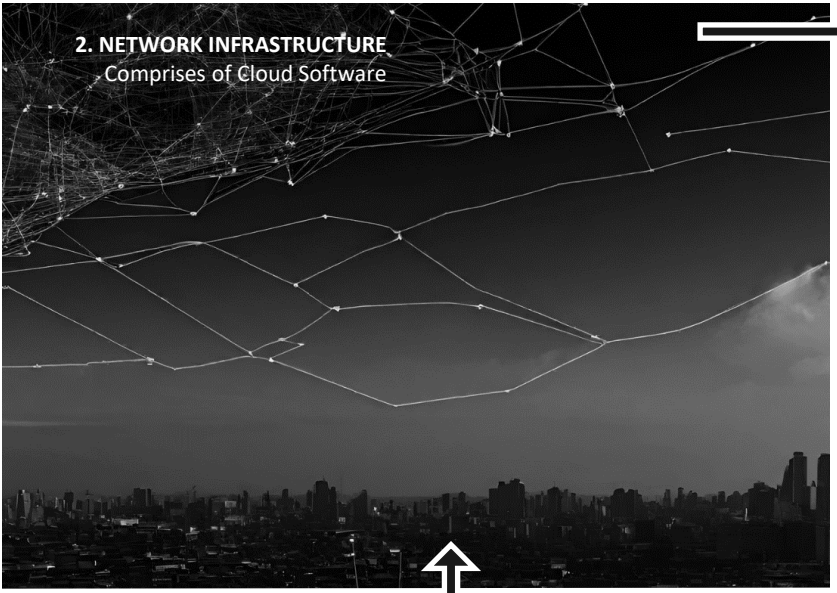



The real challenge –
ARE 4000+ INDIAN CITIES GEARED UP FOR AI?

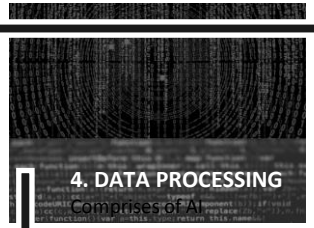
AGENTIC AI? AI is only processing algorithms – cannot perform practical functions alone

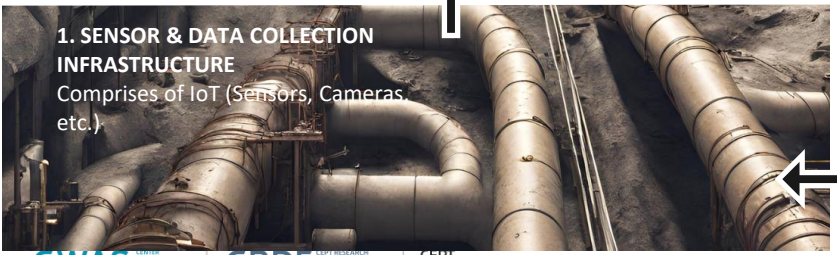


AI requires data pipelines and infrastructure



Comprises of Storage Hardware





Checking for errors

By AI

Human action

Anomaly detection

Error Diagnoses

Error Prediction

Human action can be reduced after several cycles

Asset requirement Prediction

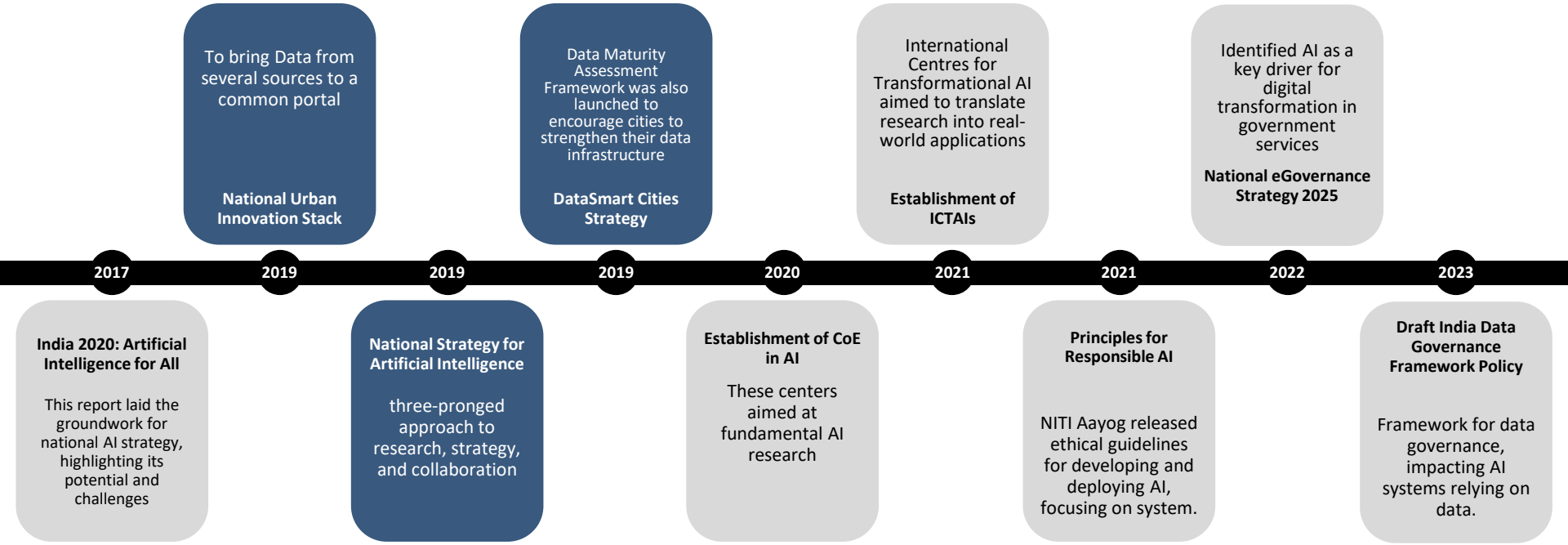
Automated Maintenance

Robotics to execute tasks such as cleaning etc.

Often the reality in Indian cities is this ....

- No digital data for AI to work on!!
- Where to put the sensor??

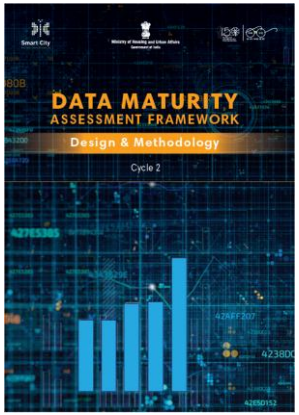
Budding policy ecosystem in India



SourceNITI Aayog. (2018). National Strategy for Artificial Intelligence - #AIforALL. https://niti.gov.in/sites/default/files/2019-01/NationalStrategy-for-AI-Discussion-Paper.pdf Approach Document for India Part 1 – Principles for Responsible AI https://www.niti.gov.in/sites/default/files/2021-02/Responsible-AI-22022021.pdf Ministry of Electronics and Information Technology, Government of India. (2022). National eGovernance Strategy 2025. https://www.meity.gov.in/e-governance India AI 2022: Towards Leading the AI Revolution. https://www.goaltideias.com/dailycurrentaffair-detail/565

Data Maturity Assessment Framework

DMAF serves as a strategic tool to evaluate the readiness of cities to effectively leverage the potential of data to address complex urban challenges in 100 Mission Cities.



Smart City
MISSION TRANSFORM·NATION

Systemic Maturity

Focuses on foundational aspects of data governance, infrastructure, and capacity building

- Policy
- People
- Process
- Technology
- Outcomes

Sectoral Maturity

Assesses data maturity across various city sectors (e.g., mobility, health, education)

- Data Availability
- Data Usage
- Data Shareability
- Data Management

DMAF 2.0 results

Tier	Cities
Connected	Surat, Pimpri-Chinchwad, Bhopal, Pune
Enabled	Nagpur, Ahmedabad, Jabalpur, New Town Kolkata, Chennai, Kohima, Thane, Raipur
Explorer	11 cities
Initiator	19 cities
Beginner	58 cities

DMAF 2.0 Performance Overview of 100 Smart Cities

45 Cities have drafted/approved their **City Data Policies**

32 Cities had a **dedicated data budget** in 2020-21 for data-related activities.

100 Cities have appointed City Data Officers.

12 Cities have formed **data alliances** and have achieved tangible outcomes.

10 Cities have conducted **data hackathons** for solutioning urban challenges.

35 Cities have leveraged their **data analytical capabilities** to generate actionable insights from available city data.

DMAF 2.0 Performance Overview of 100 Smart Cities

69 Cities have deployed sensors for data collection across urban sectors.

63 Cities have **published >30 datasets** on the Smart Cities Open Data Portal.

62 Cities have created **GIS layers** to view data effectively and support urban planning.

29 Cities have published 60+ data stories/blogs on the Smart Cities Open Data Portal.

32 Cities are working on use cases using city's data to solve urban challenges

41 Cities have leveraged their data for development of **portal and applications**

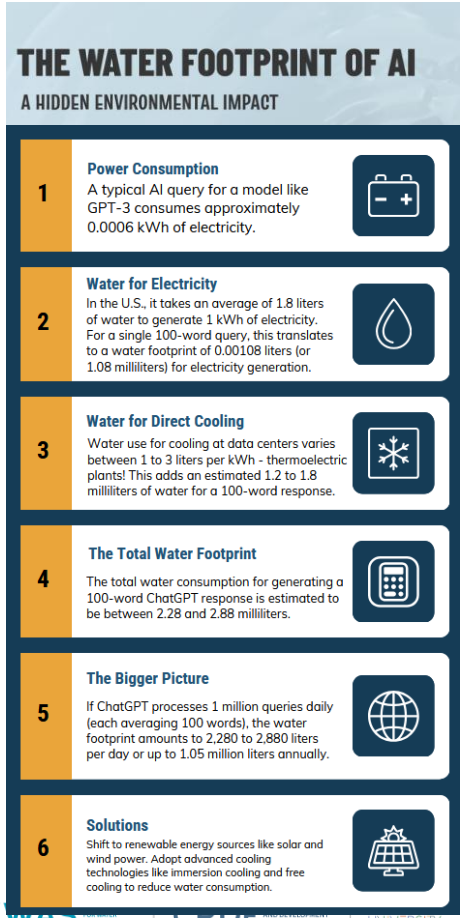
Integrated Command and Control Center - Mainstreaming monitoring and integrating modern technology in urban governance

Recent investments in ICCC in 100 SMART cities of India

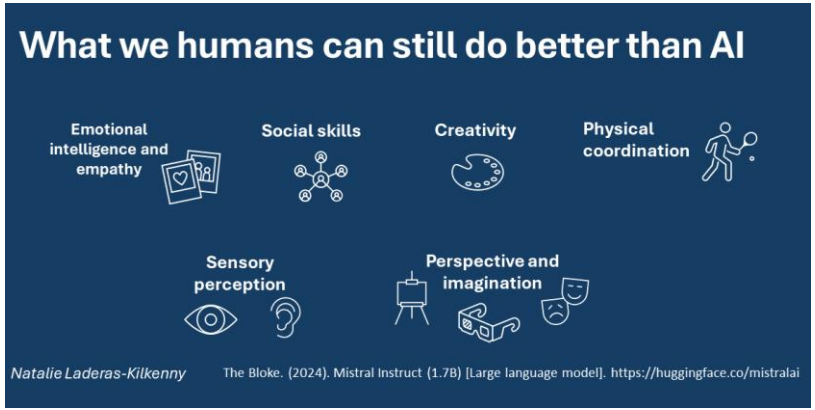
Towards data driven planning with technology

- ✓ Continuous analysis of data with dashboards for effective decision making - Better monitoring and management of city infrastructure/utilities
- ✓ Increased situational awareness leading to faster response time for services
- ✓ Improved interdepartmental coordination within urban local bodies

End with 3 thoughts …



IS AI COMING TO TAKE OUR JOBS?



"GIGO" stands for "Garbage In, Garbage Out," a principle in computer science - the output's quality is directly determined by the quality of the data fed into the system

Infamous case of Grok

Grok AI trains using data on X – formerly known as twitter (such as public posts by users) to provide "up-to-date information and insights."

A dangerous game – user comments may contain bias and cannot be taken as fact !

In your future career as young professionals –

What are your ideas for using AI and technology to solve current urban issues?

Thank you

CWAS CENTER FOR WATER AND SANITATION | CRDF CEPT RESEARCH AND DEVELOPMENT FOUNDATION | CEPT UNIVERSITY

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About us

The Center for Water and Sanitation (CWAS) is a part of CEPT Research and Development Foundation (CRDF) at CEPT University. CWAS undertakes action-research, implementation support, capacity building and advocacy in the field of urban water and sanitation. Acting as a thought catalyst and facilitator, CWAS works closely with all levels of governments - national, state and local to support them in delivering water and sanitation services in an efficient, effective and equitable manner.

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Way Forward for the Smart Cities Mission

- **Expand Beyond Area-Based Development:** Scale improvements city-wide to ensure inclusive benefits for all urban residents, especially in underserved and peri-urban areas.
- **Strengthen Urban Local Bodies (ULBs):** Invest in capacity building by training municipal staff, deploying urban planners, and enhancing administrative autonomy.
- **Bridge the Digital Divide:** Improve digital infrastructure and connectivity in Tier 2 and Tier 3 cities to make smart services more accessible and equitable.
- **Integrate Climate Resilience and Green Planning:** Mandate climate action plans and promote green buildings, clean mobility, and nature-based solutions in city planning.
- **Enhance Public Participation and Transparency:** Use ICT tools and platforms to engage citizens in planning, monitoring, and feedback for better accountability and ownership.

Challenges!

• **Limited Coverage:**

- Over 80% of Smart Cities funding is concentrated in Area-Based Development covering only 3–5% of city areas, excluding large populations.

• **Project Delays:**

- Despite 94% project completion by May 2025, many cities experienced 2–3 year delays and cost overruns up to 40%.

• **Weak ULB Capacity:**

- Only 25% of Urban Local Bodies have trained planning staff, hindering efficient implementation and innovation.

• **Digital Divide:**

- Internet access in smaller cities is just ~45%, limiting reach of smart services despite urban digital push (TRAI 2024).

• **Lack of Sustainability Focus:**

- Less than 35% of Smart Cities have integrated green infrastructure or climate resilience measures (MoHUA).

https://www.pmfias.com/smart-cities-mission

AI terminology

Artificial Intelligence (AI)
Capable of mimicking the intelligence or behavioral pattens of human or any other living entity

Machine learning (ML)
Technique by which a computer can “learn” from data, without using a complex set of rules or being specifically programmed. Based on training a “model” on big datasets through “supervised / unsupervised / reinforcement” type learning

Algorithm based and human interventio n-based learning

Deep learning
Technique to perform machine learning inspired by our brain’s own network of neurons or “neural network” (ANN = artificial neural networks)

Generative AI (GenAI)
Type of ML model that can generate data similar to the data it was trained on.

Chatbots – ChatGPT (OpenAI), Copilot(Microsoft), Gemini/Bard (Google), LLaMA (Meta), Claude(Anthropic)

Text to image – Stable Diffucions, Midjourney, DALL-E (OpenAI)

Text to video – Sora (OpenAI)

Large Language models (LLM)
Type of ML model notable for its ability to achieve general-purpose language generation and other natural language processing typically used in “chatbot” format through feeding “prompts”
NLP = Natural language processing: Ability of AI achieved through deep learning to understand and interpret human conversational language
GPT = Generative Pre-trained LLM based on “Transformer” type architecture

Big data: data sets that are too large or complex to be dealt with by traditional data-processing application software. “High volume, velocity, veracity”

Data mining: process of extracting and discovering patterns in large data sets involving methods at the intersection of machine learning, statistics, and database systems. The term "data mining" is a misnomer because the goal is the extraction of patterns and knowledge from large amounts of data, not the extraction (mining) of data itself.

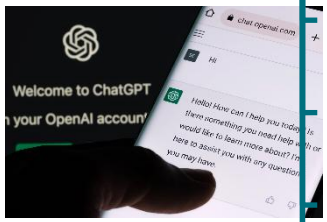
Internet of Things (IoT)
Devices, processing ability or software that enable exchange of information (translating data from the physical world to digital) over communication networks

How does AI mimic human intelligence?

Natural language processing to comb through large datasets and remove requirement of coding

Converting to “actionable information” - – image recognition, Speech recognition

Finding trends and connections that may be missed by human



instead of

- Natural language processing (NLP)
  - Context extraction
  - Classification
  - Translation
  - Question answering
  - Text generation
- Computer vision (images and videos)
  - Edge detection (raster to vector)
  - Object recognition and classification
  - Face recognition
  - Movement analysis and object tracking
  - Generated images
- Speech recognition
  - Speech to NLP
  - Language translation
  - Text to speech generation
- Pattern recognition
  - Latent trends
  - Anomaly detection