Smart Cities & Utilities – Use Cases

A smart city is an urban area that uses different types of electronic data collection sensors to supply information which is used to manage assets and resources efficiently. This includes data collected from citizens, devices, and assets that is processed and analyzed to monitor and manage traffic and transportation systems, power plants, water supply networks, waste management, law enforcement, information systems, schools, libraries, hospitals, and other community services.

A smart city enabled with Internet of Things (IoT) sensor networks and powerful spatial tools and technologies like the Geographic Information System (GIS) and GPS enables smart and efficient use of resources by utilising them only when necessary, building and empowering systems that save time, energy, and money, and improve the overall quality of life. This in its true sense unleashes the real potential and value of going "Smart".

Powered by its global & uniquely skilled partner network and backed by their cumulative experience in implementing these technologies across various developed and emerging geographies, Afriplains Digital is able to bring this powerful combination of technologies together, in a modular, seamless, integrated and business-process driven workflow, to address some of the teething problems that our thinly-stretched cities in Africa are facing today.

Let's look at some of the typical use cases where IoT & GIS can be used together to enable Smart Cities & Utilities:

1. **Smart Lighting:** Reduce energy wastage by using intelligent and weather adaptive lighting in street lights

    IoT-based smart cities are making maintenance and control of street lamps more straightforward and cost-effective. If street lights are installed with sensors and connected to cloud users can manage street lights remotely. Users can turn On & turn Off lights as per the rules which can be dynamically changed based on local weather conditions.

    In view of achieving high energy savings rules can be configured to dim, brighten, switching on-off alternate lights on road for example, the lights around pedestrian crossings can switch to a brighter setting when pedestrians are crossing the road.

    We can integrate data from streetlights with data from other sources, such as transport networks, satellite imageries etc. and visualize all these datasets spatially and temporally overlapped together on a GIS platform. It allows visualization and control of the infrastructure dynamically. For example, when a bus is expected to arrive at a bus stop, street lights around it can be automatically set brighter than those further away.

2. **Water Management:** Water leaks can be detected and corrected, and irrigation of parks can be optimized. IoT-equipped smart cities allow you to save money by giving people more control over their home utilities. IoT enables different approaches to smart utilities:

    a. **Smart meters & billing:** With a network of smart meters, cost-effective connectivity can be provided with utilities companies' IT systems. Connected smart meters can be send data directly to a public utility over a communication network, providing it with reliable

meter readings. Smart metering allows utilities companies bill accurately for the amount of water, energy and gas consumed by each household.

b. **Consumer portal/App for real time Consumption monitoring**: A network of smart meters enables utilities companies to gain greater visibility and see how their customers consume energy and water. With a network of smart meters, utilities companies can monitor demand in real-time and redirect resources as necessary or encourage consumers to use less energy or water at times of shortage. It allows citizens to use their smart meter to track and control their usage remotely. A householder can, for example, turn off their ACs, Washing machines, and home heating system using a mobile phone. Additionally, if a problem, e.g. water leakage, occurs utilities companies can notify householders and send specialists to fix the problem. Tracking of those complaints in real time can be achieved through mobile App.

3. **Transport Management:** Intelligent Transportation Systems are advanced applications that aim to provide innovative services relating to different modes of transport and traffic management and enable various users to be better informed and make safer, more coordinated, and smarter use of transport networks. It includes advanced technologies like car navigation, traffic signal control systems, and container management systems;

Through mobile interfaces, bus riders could see real time positions and get notifications in time for the bus. The data from IoT sensors can help to reveal patterns of how citizens use transport. Transport operators can use this data to enhance their traveling experience. To carry out a more complex analysis, combine multiple sources, such as ticket sales and traffic information. Transport capacity can be maximized by operators to avoid delays.

4. **Traffic Management:** Smart cities are concerned that their citizens can get from A to B as safely and efficiently as possible. How to achieve this? Different types of sensors and smart devices come into play. In-vehicle sensors or mobile apps with GPS track the location of vehicles. Road-surface sensors track the number and the speed of vehicles passing overhead. Smart traffic lights connected to a central cloud management platform allow to monitor green light timings and alter the lights in real time to prevent congestion. For example, road-surface sensors identify that the speed of the car flow has dropped to 10 mph. According to programmed rules, control application identifies there is a congestion. To relieve it, the control application triggers an output action which is defined by platform users, e.g. alter traffic lights and reroute part of the traffic. Then traffic lights' actuators receive a command from control applications and alter the lights. After part of the traffic is rerouted, the congestion is relieved without intervention from the police.

5. **Smart Parking Systems/App:** GIS based Parking solution enables near real time status of vehicles. It helps vehicle drivers to detect the nearest available parking slot.

6. **Waste Management:** Detection of rubbish levels in containers to optimize the trash collection routes. Most waste collection operators empty containers according to predefined schedules. This is not an efficient approach. It leads to poor use of city assets and unnecessary fuel consumption. IoT-equipped smart city solutions track waste levels and provide route optimization and operational analytics. A typical smart waste collection system is hosted centrally on cloud and gets data about

fill level, temperature and tilt from sensors through communication node. The solution can be integrated with analytics tools and control applications for accessing, managing and analyzing this data.

Once the data from sensors is received at central cloud platform, it is analyzed and used to trigger certain actions. For example, a fill-level sensor identifies that the level of garbage in a container is close to an upper threshold. Control applications integrated with the cloud platform use predefined rules to take the right action, e.g. send an alert to a truck driver who uses a mobile app. It helps to avoid emptying half-full containers. We can collect fill-levels statistics on each container and manage all the containers in the area. Using analytics tools integrated with cloud management platform we can get insights from these statistics to optimize the routes and the collecting schedule.

7. **Noise Pollution:** Sound monitoring in public zones is done in real time using strategically placed IoT sensors. Furthermore, by employing spatial and temporal analysis tools to analyze the data collected through the sensors, the management team thematically demarcates the key priority areas for planning and oversight.

8. **Structural Health Monitoring:** Monitoring and management of vibrations and material condition in buildings, bridges, and historic construction can be carried out efficiently and comprehensively.

9. **Citizen Information System:** Cloud based big data automation enables proactive route planning and efficient, well managed traffic flow using real time traffic maps and sensor based alerts and notifications.

About:

This document has been published by **Afriplains Digital**, in partnership with **FairEarth Consultants**.

This document should only be utilized as an information source to understand, at a broad level, how an integrated and comprehensive approach to utilizing IoT and Spatial Technologies can be useful for implementing Smart Cities & Utilities that stand the test of tomorrow.

For More information on our GIS-based Smart Cities & Utilities Solutions, please feel free to reach out to us by email on info@afriplains.com , via phone on +255- 623859150 or via our digital & social media channels below:

LinkedIn | Twitter | Facebook