Solution Proposal

MKC SMART System for Monitoring Facilities at Real Time

Presented By

Smart City, Kochi,
Kerala, India

www.naicoits.com

Presented To

Markaz Knowledge City,
Landmark World
NH 17 Bypass, Calicut.
Kerala. 673014
www.mkconline.com/

Project Objective

To develop an integrated monitoring system across the MKC campus enabling timely and informed decisions.

The system will enable real time monitoring of various resources within MKC campus and provide actionable insights on the demand, consumption and forecast of resources for optimal utilization, result in increased productivity with enhanced customer experience.

MKC – Campus Facilities

MKC campus is an Integrated Education Township with multiple tenants broadly categorized in to…

- Academic Facilities
- Residential Facilities
- Commercial Facilities
- Socio-Cultural Facilities
- Healthcare Facilities
- Vehicle Parking Facilities

Note: The network connection of the campus utilities can be wired, wi-fi or a combination of both.

Existing MKC Facilities/ Tenants

Tigris Valley	School of Architecture
Fezzin Hotel	School of Business Studies
Excellency Club	Alif Global School
Special Need School	M Tower Apartments
Dormitory/ Admin Block	Sports School
Markaz Law College	Park Masjid
Unani Research Center	Pharmacy College
Unani Medical College	Landmark
Design Bridge International	Hostel near SNS
Library & Research Center	Guest Flow
School of Islamic Studies	Common Areas
Cultural Center	WIRAS

Project Scope (1/2)

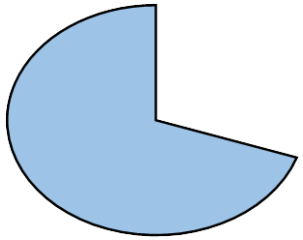
The project scope includes the following application modules:

1. Water Resources Management
2. Power Resources Management
3. Vehicle Parking Space Management
4. Environment Monitoring System

Naico will implement a central smart solution encompassing the above management systems. The data from each management system will be obtained from the abovementioned management systems and utilized to gain insights.

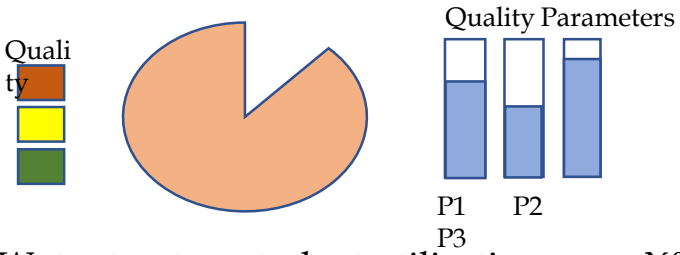
Project Scope (2/2) – MKC Campus Dashboard Requirements

Water Sources Dashboard



Water level	X%
Projected Water availability	Y days
Consumption per day	Z Litres

Water Treatment Plant



Water treatment plant utilisation	X%
Consumption per day	Z Litres

Power & Energy Dashboard

Power Consumption	700KVA
Load capacity	350 KVA
Source wise consumption	200 KVA

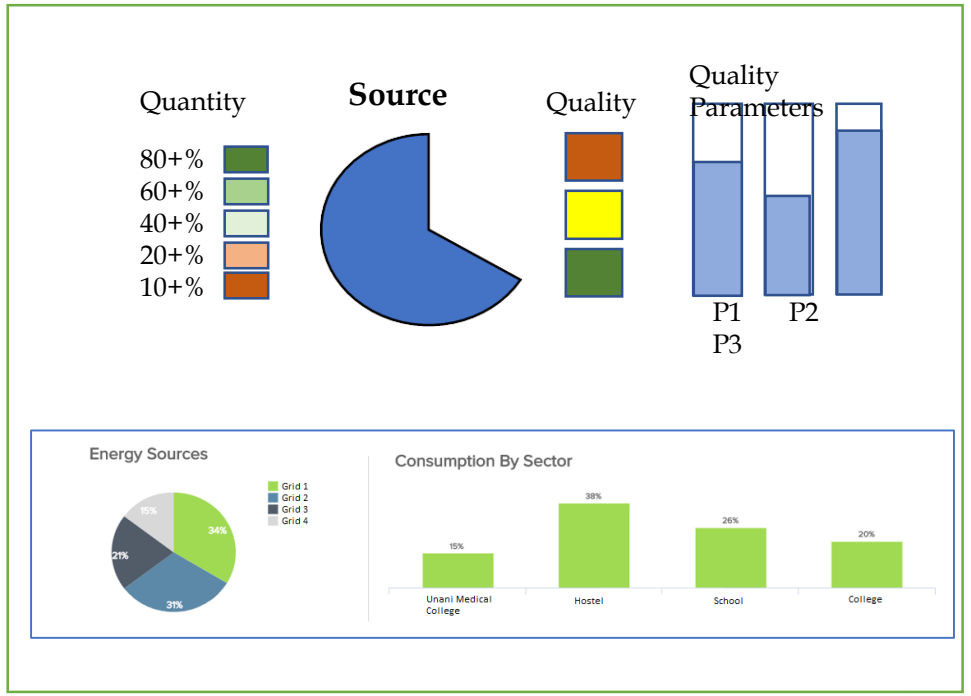
Vehicle Parking Space Dashboard

Total Parking slots	50
Occupancy	30
Vacant slots	20

Environmental Monitoring

Proposed System Modules – Logical Layout

MKC Monitoring System Dashboard



Water Resource Management – MKC Campus (1/2)

Water Resource Management in MKC facility will be able:

- To track the available quantity of the water resources in the campus.
- To track the average daily consumption.
- To gain insights about the reservation/ storage quantity based on the consumption for a given period.
- Sewage Treatment Plant Monitoring System will be included in this system with the following capabilities:
  - Track the inlet flow
  - Monitor Qualitative parameters
  - Track Treated water Consumption

- To monitor the qualitative parameters at sewage treatment plant. The quality parameters include:
  - **pH**: pH is the measure of how acidic/basic water is. Unit is pH.
  - **Turbidity**: Turbidity is the measure of relative clarity of a liquid. Unit is NTU
  - **TDS**: Total Dissolved Solids, amount of organic and inorganic materials dissolved in a particular volume of water. Unit is ppm.
  - **COD**: The chemical oxygen demand (COD) is the amount of oxygen consumed when the water sample is chemically oxidized.
  - **BOD**: The biochemical oxygen demand (BOD) represents the amount of dissolved oxygen (DO) consumed by biological organisms when they decompose organic matter in water.

Water Resource Management – MKC Campus (2/2)

The sensors used for water resources management are:

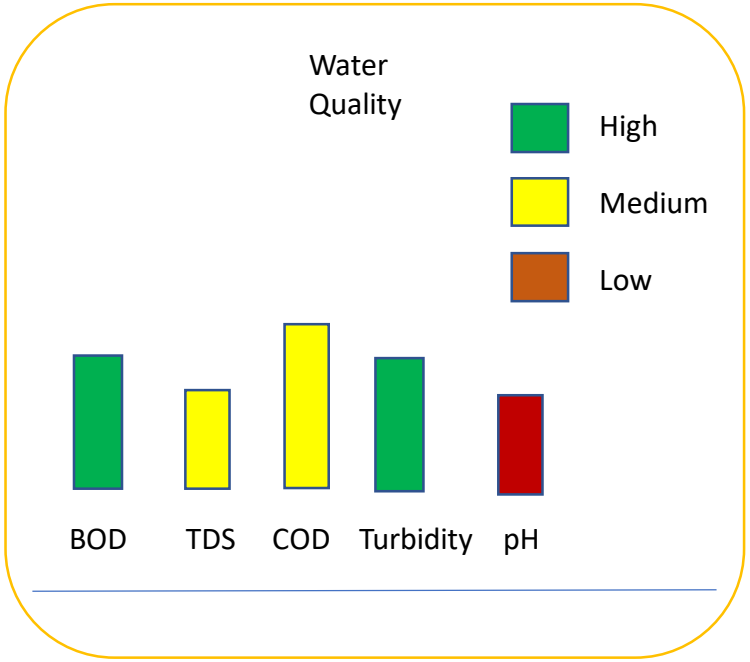
1. **Water level Sensor**: To determine the water level of sources and intermediary tenant water storages.
2. **Digital Flow Meters**: To estimate the consumption of water. At the campus and tenants with in the campus.
3. **Quality Parameter Sensors**: To track the qualitative parameters for STP and for addition of chemicals.

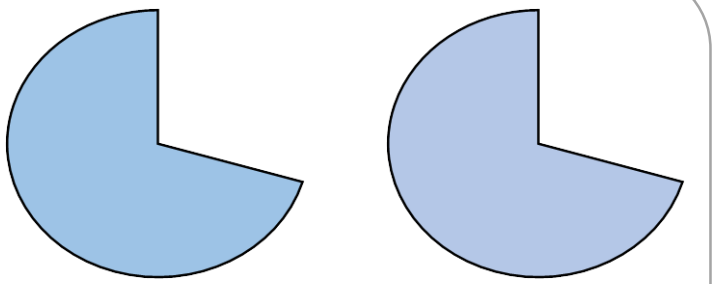
Note: Data from these sensors will be digitally captured and fed into MKC monitoring system.

Water Resource Management – MKC Campus Dashboard

Note: Dashboard elements for Water Resource Management in MKC facility is shown below. Dashboard for individual tenant will be customized for each tenant with tenant-wise data.

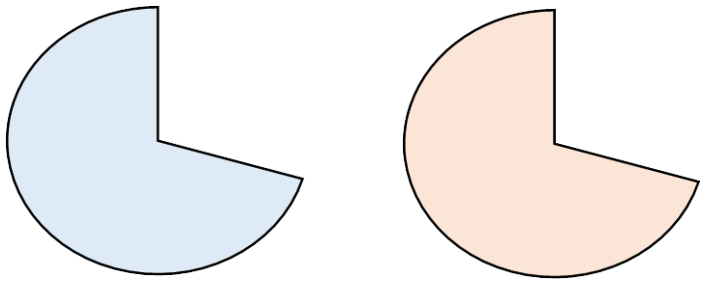
Water Sources	Tenant Storage	Consumption	Waste water
Open Well Mini Dam Natural pond Others	Over head Tank Slump Tank Others	Kitchen Wash Rooms Toilets Clinical Rooms Others	Drainage water Others





Water level
Projected Water availability
Consumption per day

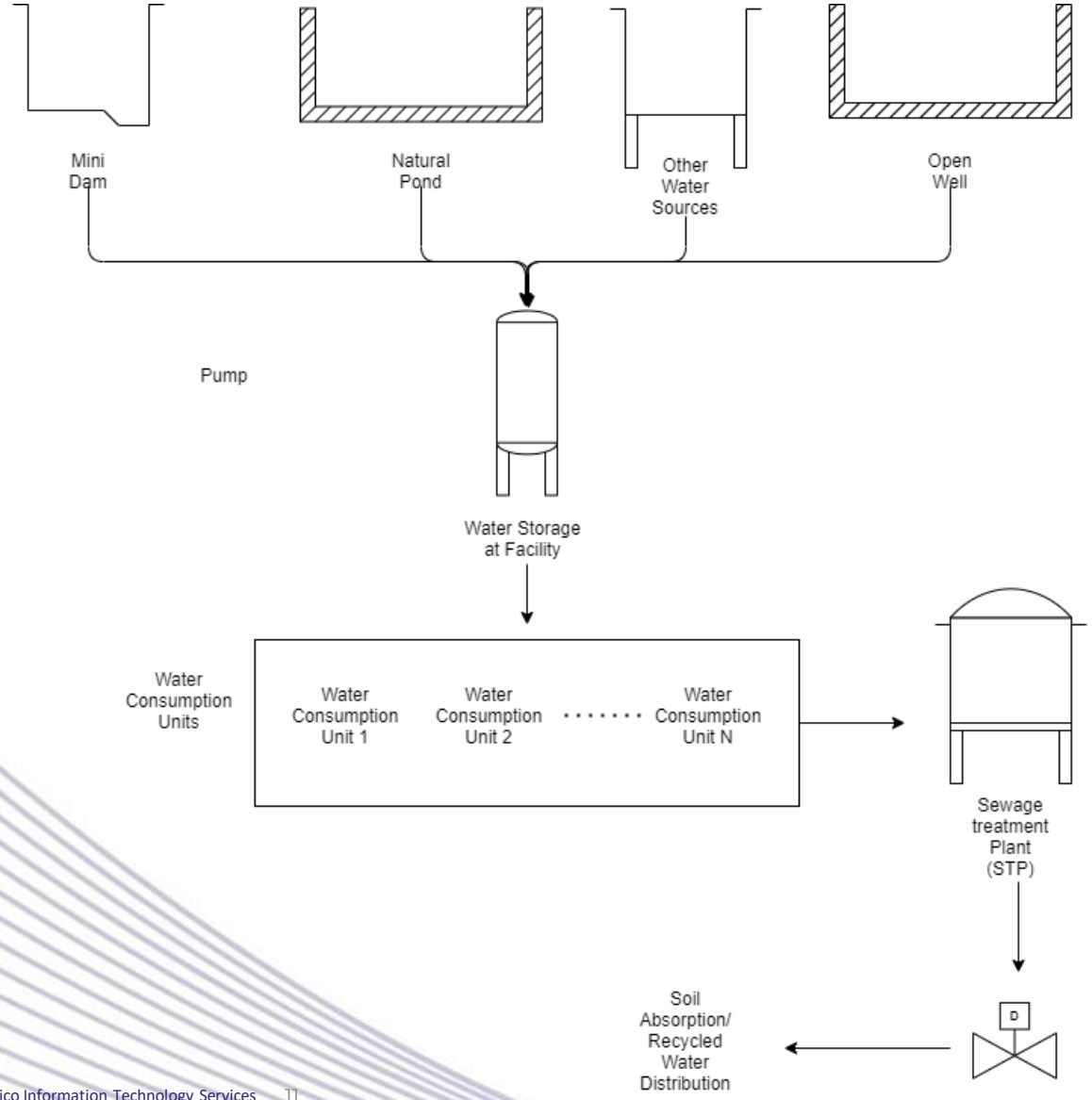
X%
Y days
Z Litres



Normal water per day X litres
Recycled water per day Y litres

Water treatment plant utilization X%
Consumption per day Z Litres

Water Resource Management – Conceptual Layout

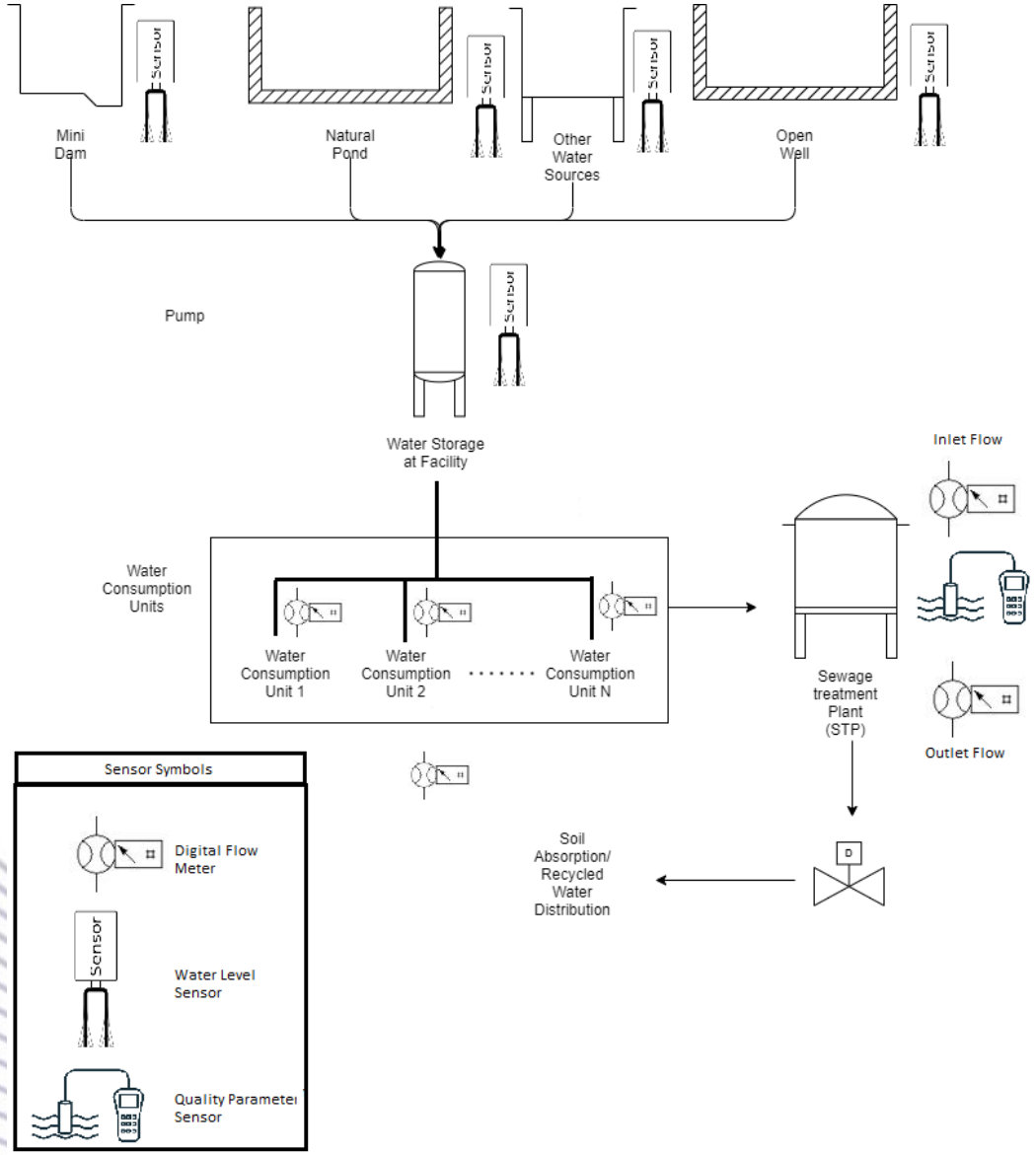


1. Water Level
2. Flow Rate
3. Qualitative Parameters

MKC Monitoring System Dashboard

1. Water Availability
2. Water Consumption
3. Water Quality

Water Resource Management – Sensor Implementation Layout



MKC Monitoring System Dashboard

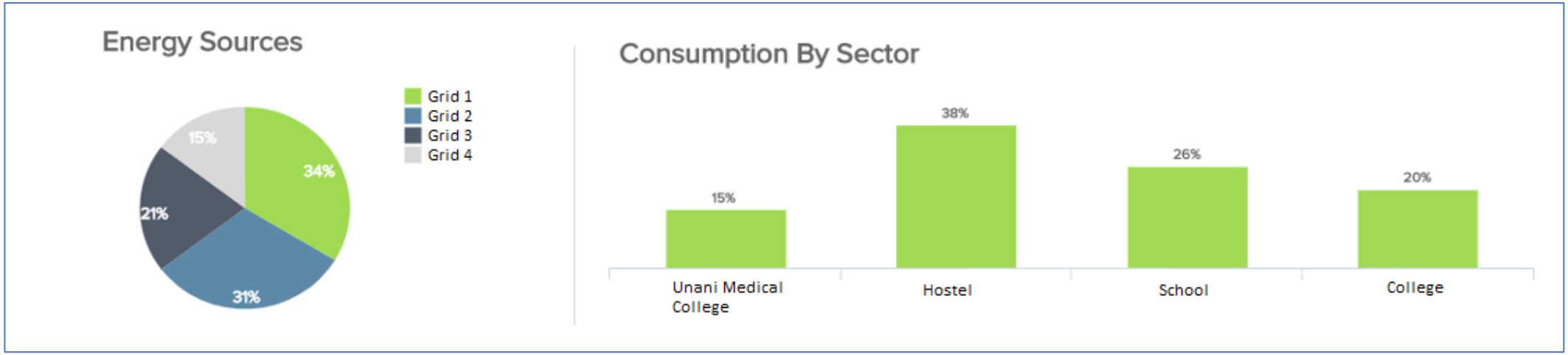
1. Water Availability
2. Water Consumption
3. Water Quality

Power Resource Management – MKC Campus

- The objective of Power Resource Management is to monitor and manage the power consumption at the MKC campus.
- Through Power Resource Management, we will able:
  - To find out the facility wise consumption and load capacity.
  - To determine the split-up of power consumption of each facilities by placing smart digital meters for each tenants/ facilities.
  - To track the load balancing on generator and inverter.

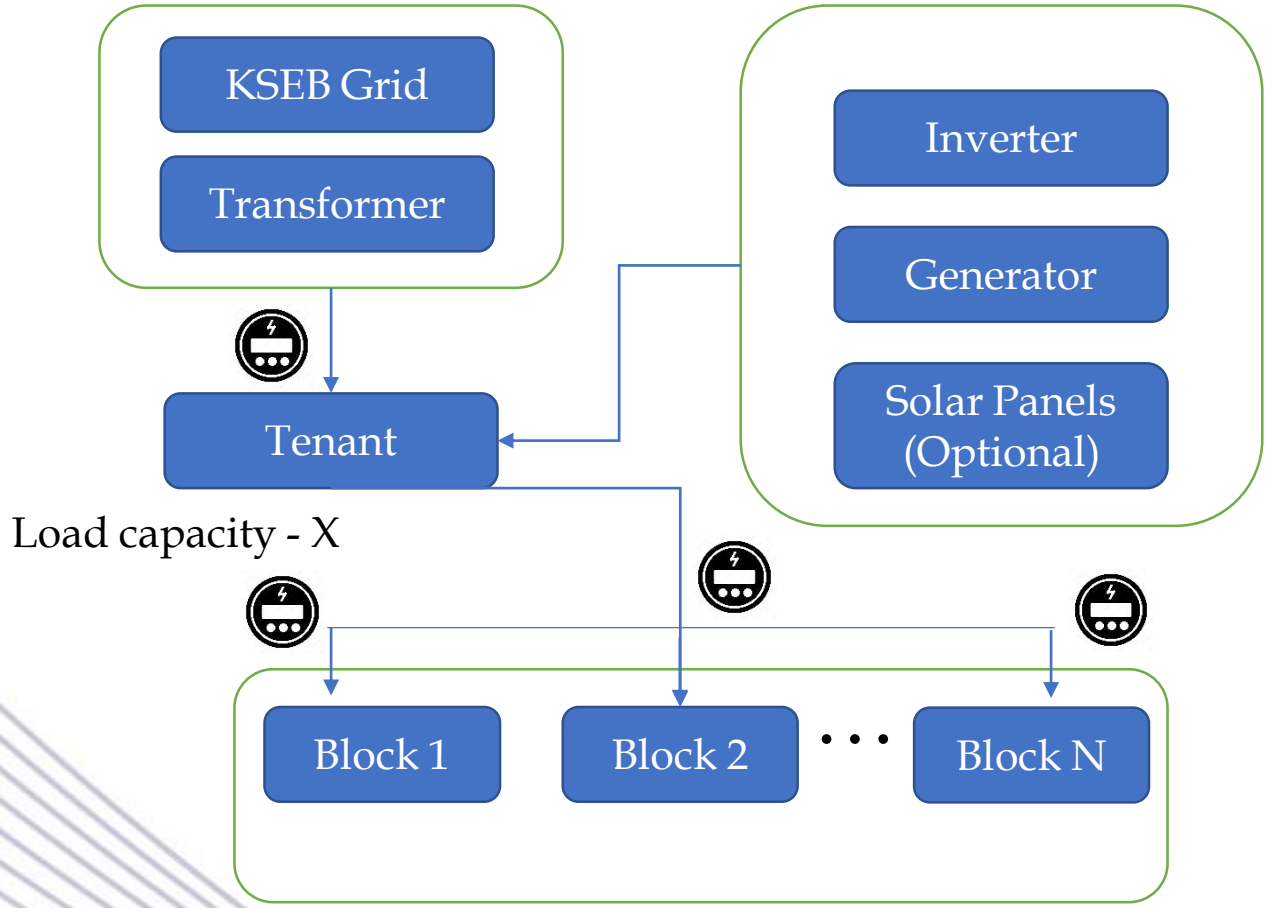
Bill of Materials will be shared to MKC team. Data from smart meters will be captured and fed into MKC Monitoring system. The billing calculation for power consumption will be done tenant-wise.

Power Resource Management – Dashboard Elements



- Power consumption in the Campus will be captured using smart digital meters installed at the facilities.
- Power distribution from multiple sources will be tracked through smart Digital meters.
- To compare Load versus source-wise consumption
- Naico Dynamic Monitoring Dashboard will provide High level view of Power consumption in the campus with a detailed view of consumption at each tenant and consuming units as required by the tenant to optimize their power consumption.

Power Resource Management – Logical layout



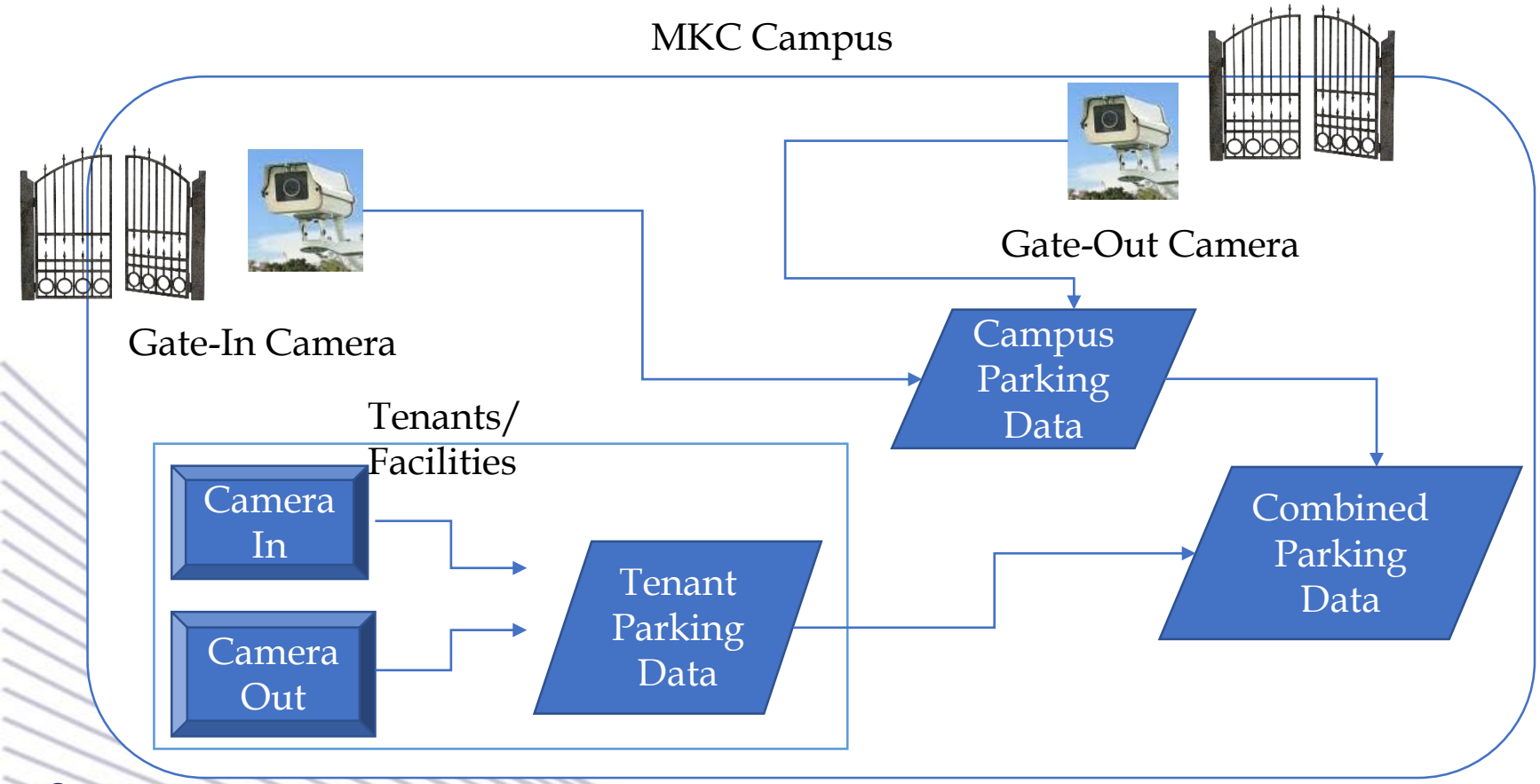
MKC Monitoring System Dashboard

1. Source wise Demand and Consumption
2. Facility wise Load and Demand
3. Consumption Timeline Pattern

- Digital Energy Meter

Vehicle Parking Management System – MKC Campus (1/2)

Vehicle Parking Space Management in Parking Lots is done through cameras. The count of incoming and outgoing vehicles are calculated by number of camera clicks (snap image count) for calculating the space occupancy. The difference in the count will denote the space occupancy.



MKC Monitoring System Dashboard

1. Vehicle Space Availability
2. Space Occupancy

Vehicle Parking Management System – MKC Tenant

- Cameras will be installed in campus Gate-In and Gate-Out. A snapshot will be taken when the vehicle comes in or goes out of the gate. The difference in count of snapshots taken from Gate-In and Gate-out cameras will be used to count the number of vehicles present inside the campus.
- The 'Camera In' & 'Camera Out' camera equipment installed respectively at entry and exit points in the parking lots of each tenants. The count of unique snaps will be used as captured data to estimate the space occupancy of the parking lot with respect to each tenant.
- The data captured will be fed into MKC monitoring system to gain insights.

Environment Monitoring System

There will be built-in modules installed in the campus to determine the air quality and meteorology data. The Meteorology and atmospheric data will be captured through sensors which will be installed inside the MKC campus. The sensor data captured will be fed into MKC monitoring system to gain insights.

Ambient air quality

- ✓ Air Quality Index (AQI)

Meteorology

- ✓ Wind Speed & direction
- ✓ Temperature
- ✓ Humidity
- ✓ Rainfall

MKC Monitoring System Dashboard

1. Qualitative Measures
2. Weather Report

Pilot Implementation of MKC Monitoring System

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WIRAS

Pilot Implementation of MKC Monitoring System – WIRAS

WIRAS (World Institute of Research & Advanced Studies) is a pilot project for smart building project with MKC. WIRAS, a building facility houses over 300 students helping them with their education and accommodation. In addition, WIRAS also accommodates over 10 staffs in the facility.

The objective of the pilot project will be to monitor and control the consumption of water and power supply within WIRAS campus along with managing the operations of sewage treatment plant.

WIRAS– Existing Water Resources

- All water supply needs for WIRAS facility is addressed by an Overhead tank (OH).
- There are 2 primary water sources which supplies water to Overhead Tank, they are the Mini dam (Artificial Dam) and Open well situated at different locations inside MKC campus.
- From the overhead tank, water is supplied to Kitchen, washroom and toilet flush. The used water from Kitchen, domestic taps and bathrooms/ washrooms flows directly to Sewage Treatment Plant (STP). The used water from the toilets flows to the septic tank. The overflow from the septic tank flows directly to Sewage treatment plant.

Available details of water resources in WIRAS are:

- Over Head tank (80000 KL): Available for consumption (40000 KL). Balance water is reserved for emergency and Fire - and safety compliances.
- Source of water Supply (Connected Sources)
- Open Well (6m diameter)
- Mini Dam (2 Cr Liter)

Water Consumption Facilities
Kitchen
Washrooms
Toilet Flushing

Sewage Treatment
Sewage Treatment Plant (50 KLD)
Drainage (Kitchen + Washroom)
Septic Tank (80 KL)

WIRAS– Existing Power Resources

One HT line (Individual metering) from KSEB main power lines is distributed to 5 buildings as individual LT lines (normal metering/ analog metering). The distribution is through 400 KV transformer. One of 5 lines is connected to WIRAS facility. In each 5 lines, analog metering is provided in each feeder for getting the meter readings of power consumptions.

WIRAS has a routed and metered power supply from KSEB with a load capacity of 133KV supported by a DC generator of 62.5 KVA. The connected load is estimated to be 150 KV including AC units. The demand is currently limited to 20 KV but when the student capacity increases, load limit raises to 30-40 KV range. Currently, the AC unit provisioning is limited in WIRAS facility.

WIRAS mainly consists of consumption units and power backup units as shown in the tables below:

Power Consumption Blocks
Hostel
Classrooms
Admin Office (Chairman, MD)

Power Backup Units
Inverter (5KVA)
AMF Generator (62.5 KVA)
Solar Panels (Optional)

Pilot Implementation – WIRAS High Level Scope (1/2)

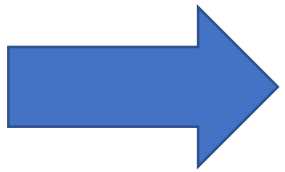
High level scope of pilot implementation includes a responsive web application that will run on both web and mobile platforms. There will be 2 types of users: Admin & Tenant.
(Note: As of now, Naico is working with Tropical Environmental Solutions (TES) for developing the monitoring solution for sewage treatment plant, so MKC & TES together will decide the data integration between STP monitoring system with MKC monitoring dashboard application.)

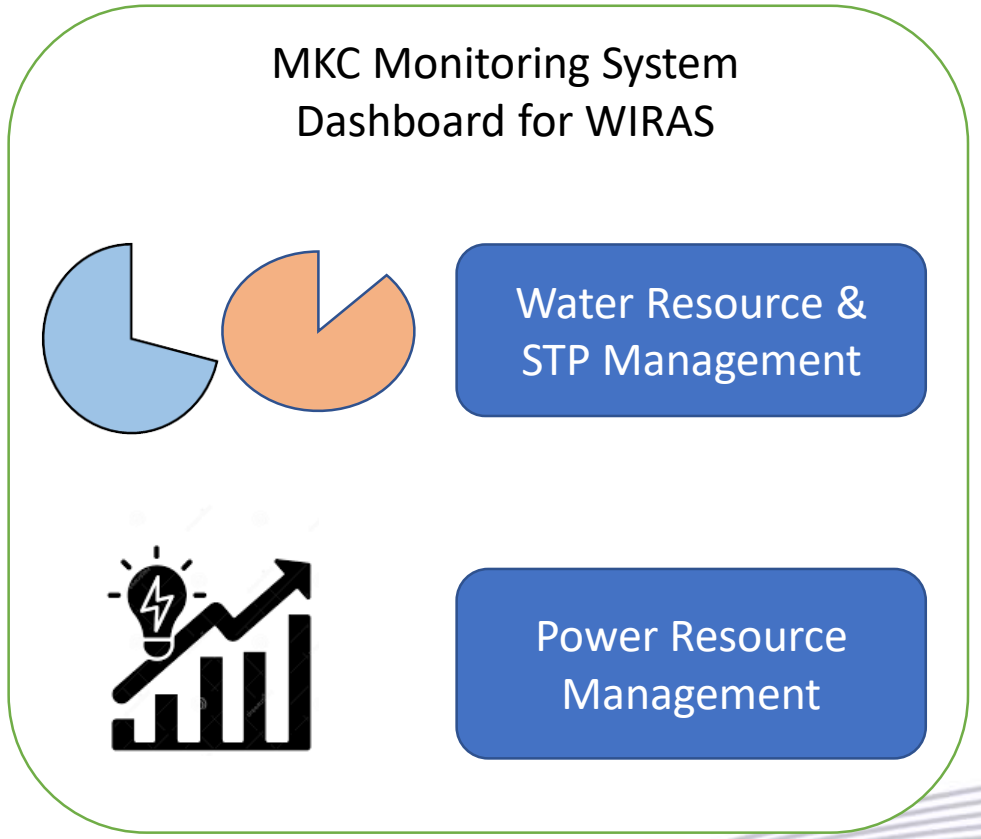
Power Consumption Data - WIRAS

1. Power Consumption Meter Readings
2. Load Factor data

Water Consumption Data - WIRAS

1. Water Level
2. Flow Rate
3. Qualitative Parameters (STP)

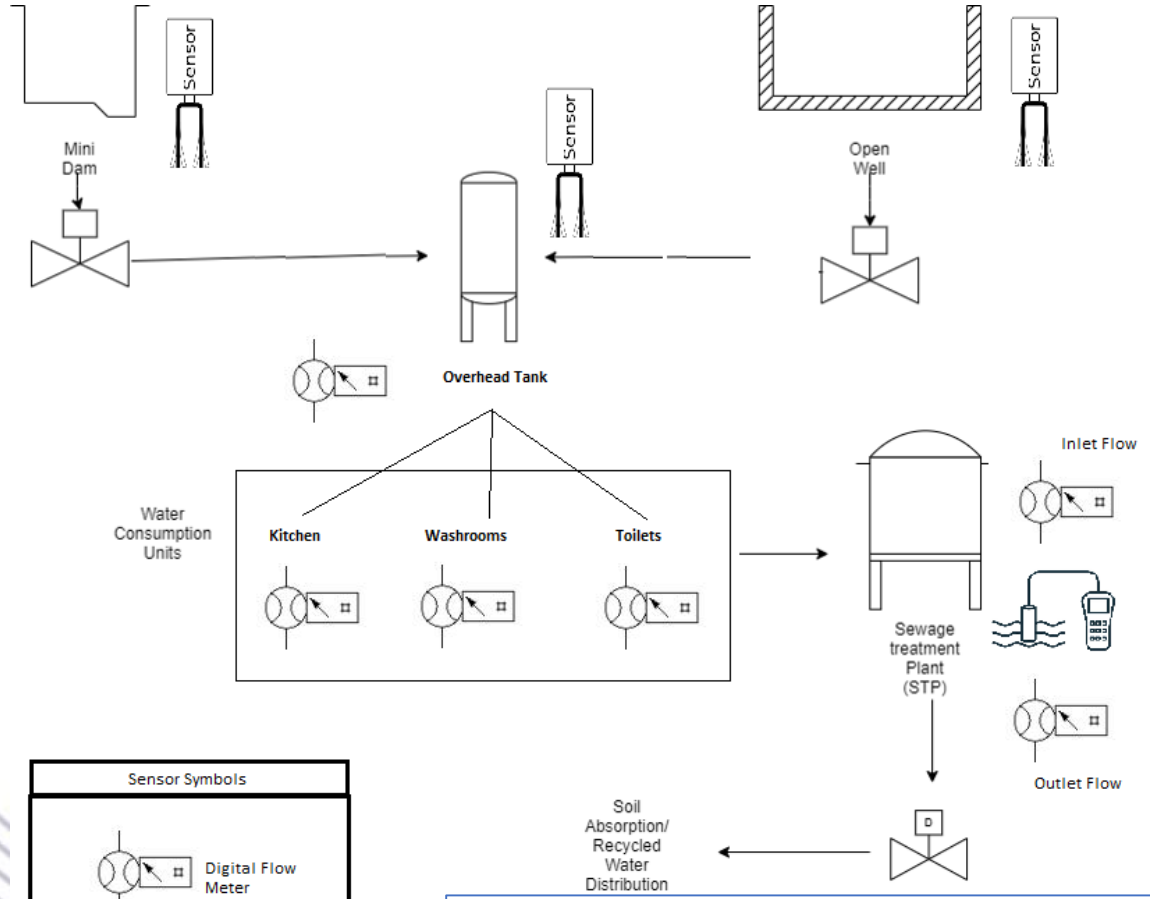




Pilot Implementation – WIRAS High Level Scope (2/2)

- Admin & Tenant can login to the dashboard using registered username and password.
- Admin will have privilege to view the dashboard of all facilities inside MKC campus while Tenant will have privilege to view the dashboard of assigned facility. Admin will have the privilege to add new users and assign the privilege to view data of their respective facilities.
- Admin and Tenant dashboard will consist of data related to water resources, power resources and Sewage Treatment Plant. Major modules of Monitoring app dashboard include:
  - **User Management**: To regulate and monitor access privileges of the users
  - **Tenant Management**: To regulate and monitor facility access privileges of Tenant by Admin
  - **Water Resource Managemen**t: Dashboard & Reports (Availability, Consumption, Forecast)
  - **Power Resource Management**: Dashboard & Reports (Consumption, Load comparison)
  - **Sewage Treatment Plant Managemen**t: Dashboard & Reports (Available Treatment capacity, % Treatment capacity utilization, Treated water availability, Water Quality Monitoring).

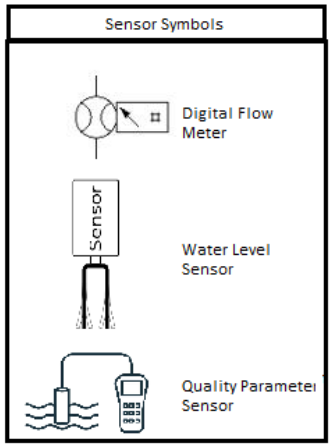
Water Resource Management of WIRAS – Logical Layout with Sensors



1. Water Level
2. Flow Rate
3. Qualitative Parameters

MKC Monitoring System Dashboard

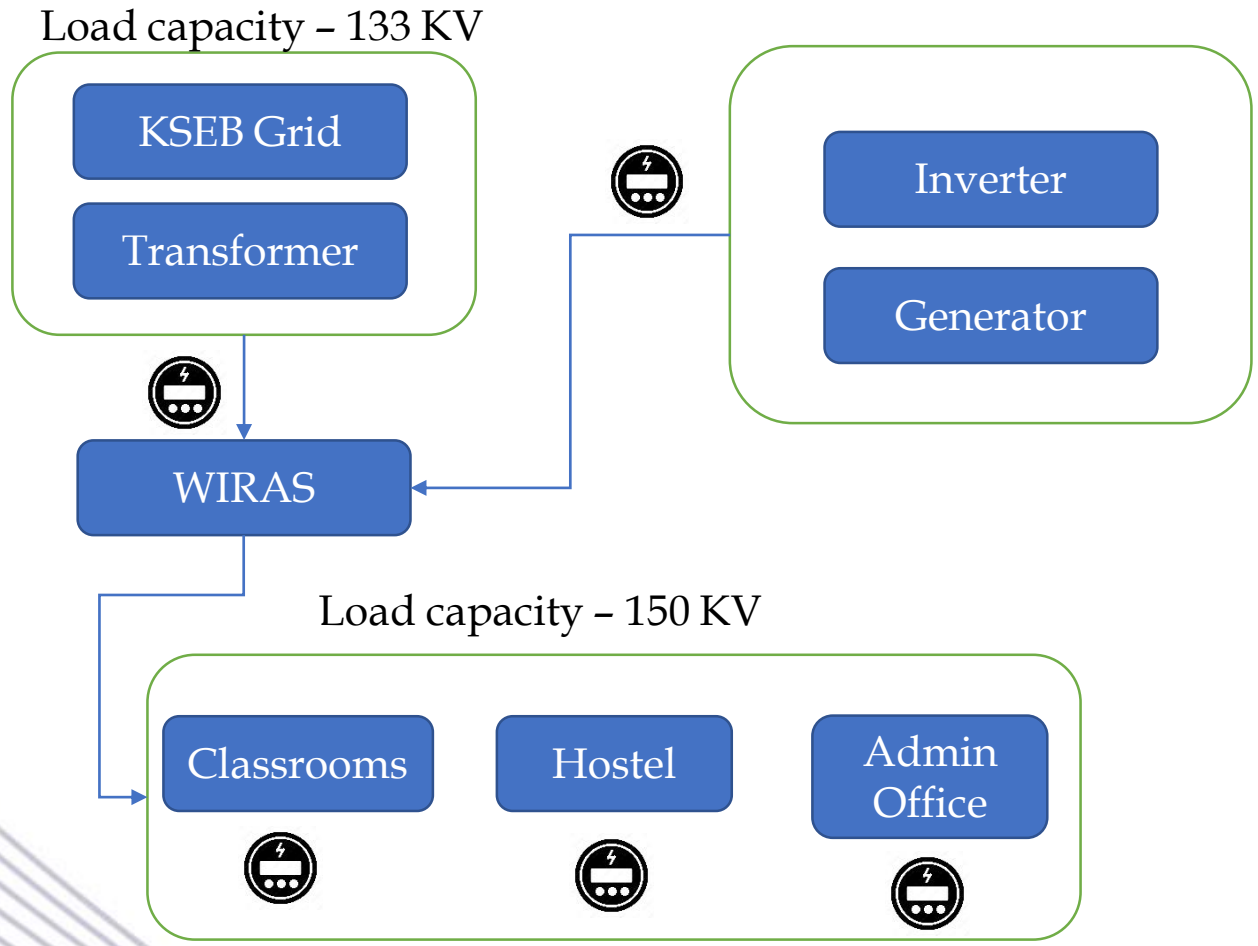
1. Water Availability
2. Water Consumption
3. Quality Level Data for addition of chemicals



Note:

- Identified water consumption units are Kitchen, washroom and Toilets.
- Dashboard will also monitor the addition of chemicals in Sewage treatment plant.
- Flow meter at the tenant are decided based on the assumption that water consumption is tracked separately for kitchen, washroom and toilet as per the discussion with the client.

Power Resource Management of WIRAS – Logical Layout



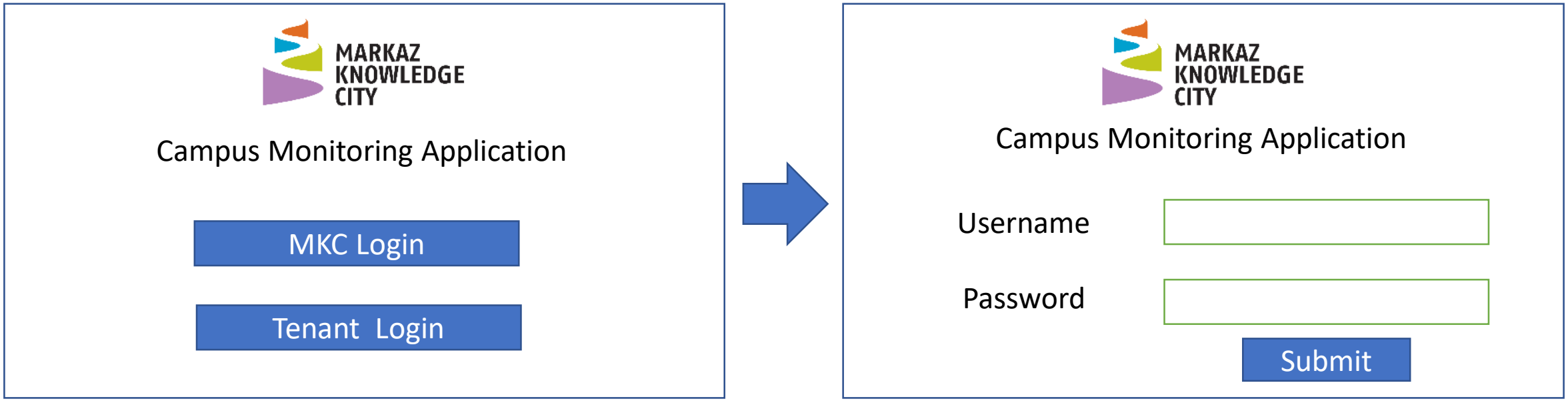
MKC Monitoring System Dashboard

1. Source wise Demand and Consumption
2. Facility wise Load and Demand
3. Consumption Timeline Pattern

- Digital Energy Meter

Note: Identified power consumption units/ blocks are classroom, Admin offices and Hostel.

Screens – MKC Campus Monitoring App



Screens – MKC Campus Monitoring Dashboard Application

- The Monitoring Dashboard is a responsive web application accessible on any device.
- The Monitoring Application will provide dashboard view at Campus level and Tenant level for various resources (water, power and STP)
- Access to Dashboard are managed based on the User profile (MKC user will have the access to the campus dashboard with capability to drill down to the tenants).
- Tenant user will have visibility to the respective tenant dashboard only.

MKC Campus Monitoring Admin Dashboard - Water

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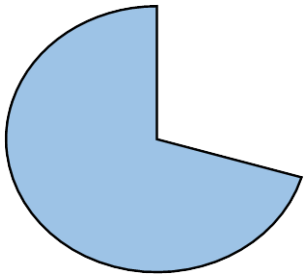
Water | Power | Sewage Treatment

MKC

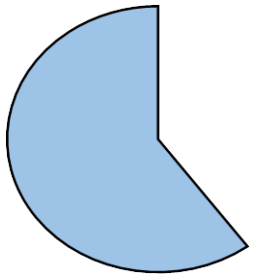
Tenant WIRAS

Kitchen



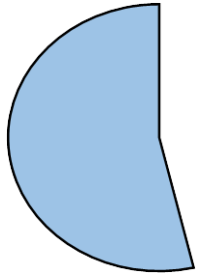
Water level	88%
Projected Water availability	21 days
Consumption per day	640 Litres

Washrooms



Water level	78%
Projected Water availability	21 days
Consumption per day	440 Litres

Toilets



Water level	68%
Projected Water availability	21 days
Consumption per day	340 Litres

MKC Campus Monitoring App Tenant Dashboard - Water

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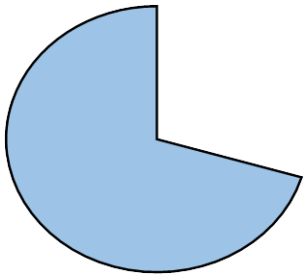
Water | Power | Sewage Treatment

WIRAS

Kitchen



Water level	88%
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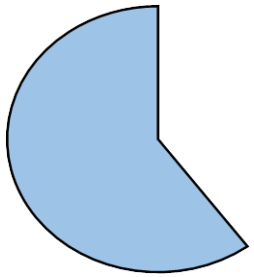
Washrooms



Water level	78%
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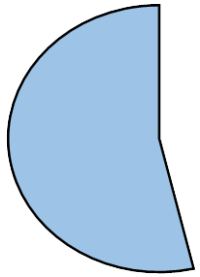
Toilets



Water level	68%
Projected Water availability	21 days
Consumption per day	340 Litres

MKC Campus Monitoring App Admin Dashboard – Power

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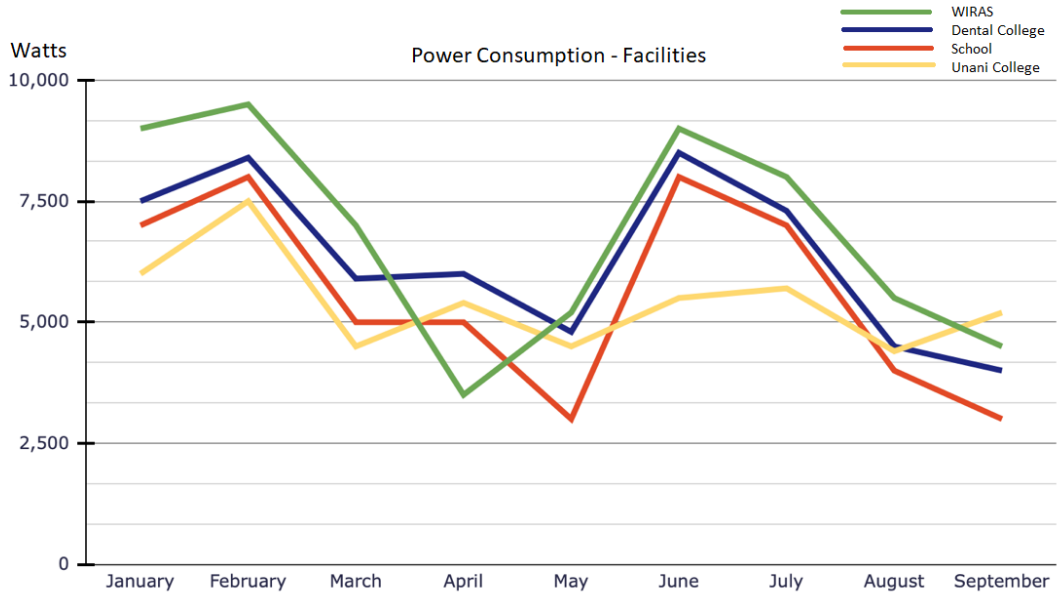
Water | Power | Sewage Treatment

MKC

Power & Energy Dashboard

Power Consumption	700KVA
Load capacity	350 KVA
Tenant: WIRAS	200 KVA



MKC Campus Monitoring App Tenant Dashboard - Power

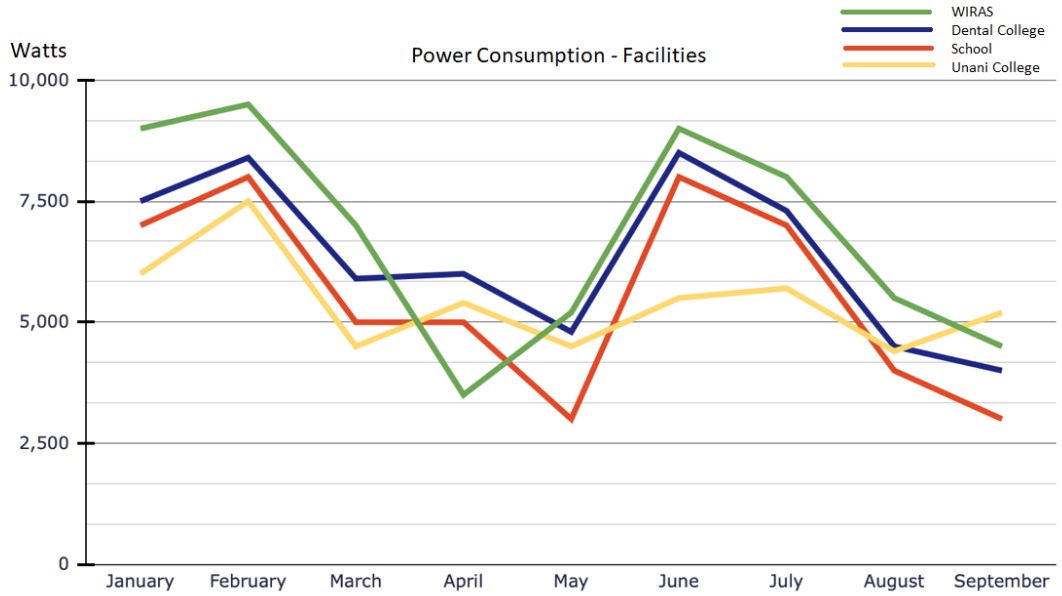
MARKAZ KNOWLEDGE CITY

Water | Power | Sewage Treatment

WIRAS

Power & Energy Dashboard

Power Consumption	700KVA
Load capacity	350 KVA
Tenant: WIRAS	200 KVA



MKC Campus Monitoring App Admin Dashboard - STP

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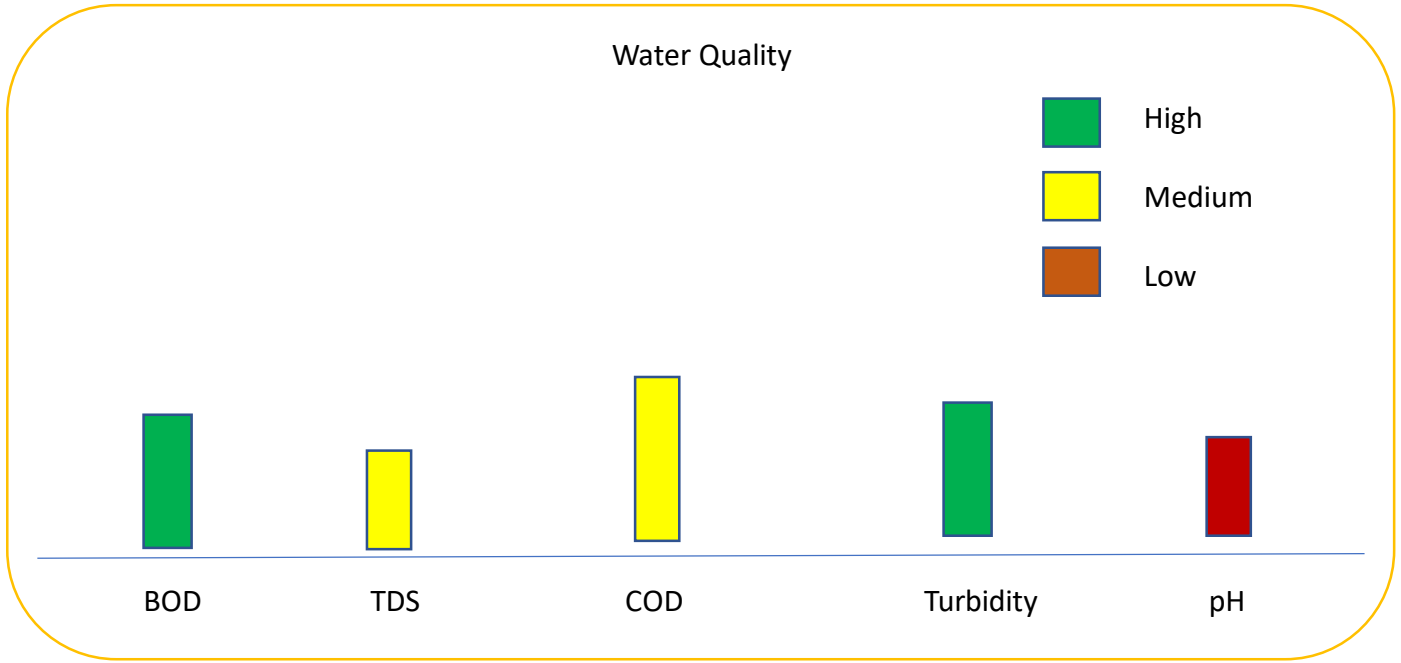
Water | Power | Sewage Treatment

MKC

Tenant: WIRAS



Proposed Technology Stack – Monitoring App Dashboard

Application Component	Technology
Front End	Angular/ React JS
Back End	Node JS
Database	MongoDB

Assumptions

- Sensors will be communicating with RS-485 protocol through a wired connection (serial communication). Connection range is approximately 3000 ft.
- In case of installing sensors in Sewage treatment Plant, sensors will be integrated into single unit as part of cost-effective approach.

Out of Scope

- Anything not considered in the proposal will be out of scope.
- VSS Sensor and Coliforms Sensor for STP are not included in the proposal.

Execution Model

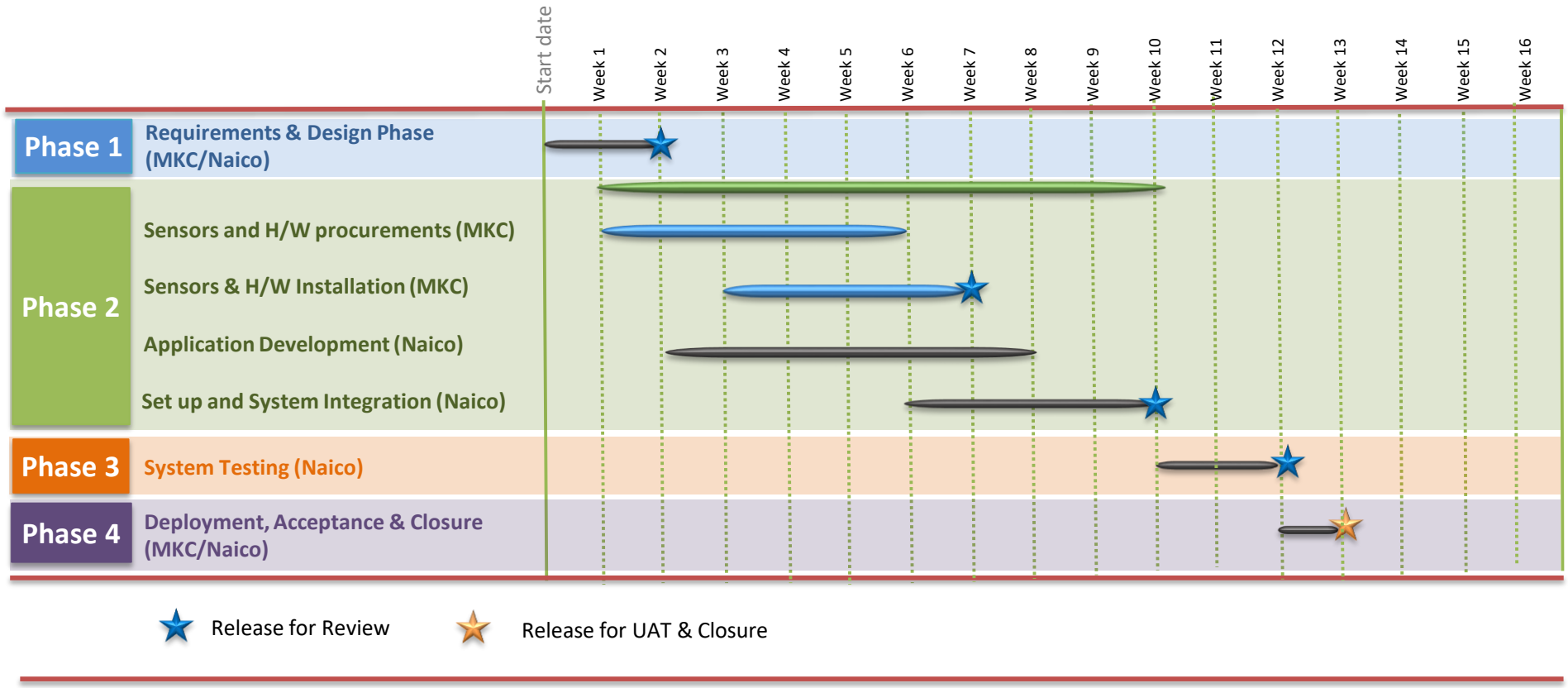
MKC and Naico will collaboratively work for successful execution of the project in phase wise approach. Both Naico and MKC will assign a SPOC (Single Point of Contact), and will be responsible for the overall project.

Naico and MKC jointly decide the placement and installation plan of the sensors and other hardware items. Based on the approved Installation plan and BOM, MKC will procure the bill of materials (BOM) and complete the installation for Naico to set up and integrate with rest of the system.

Application development will be initiated with setting up of solution architecture, development and testing environments. Naico team will set up the framework for dashboard application along with the definition of interfaces with sensors. The UI designs for the dashboard application will be prepared and sent to MKC for review. After confirmation from the MKC, designs will be given to development team. The dashboard application development will follow the agile process of 2 weeks of sprints.

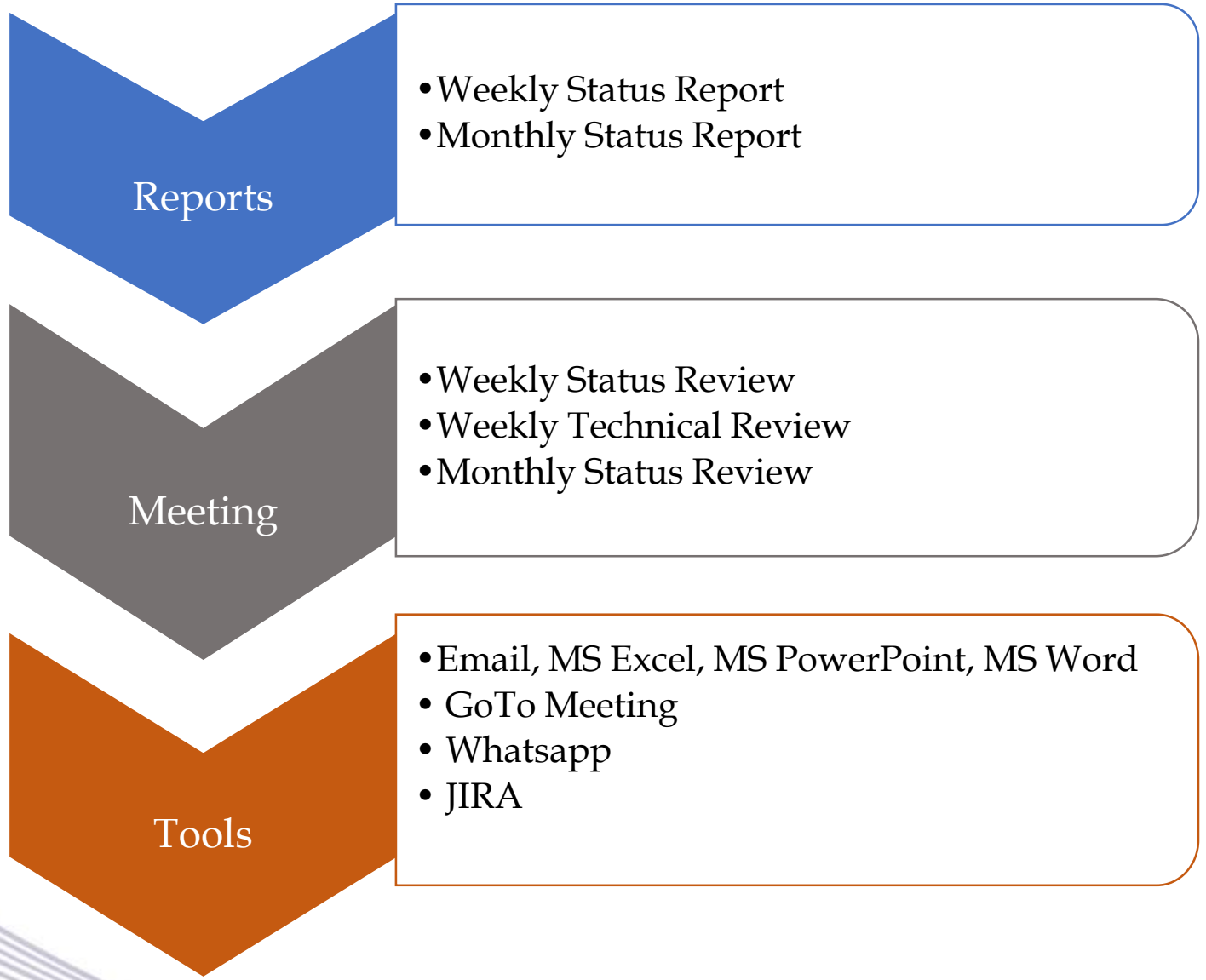
Naico will work with MKC and make sure that the sensors and other hardware devices are tested before the installation. Once the system integration and testing is over, MKC will do the acceptance testing and will take over the project with required training from Naico.

Project Timeline – WIRAS



Note: Major dependency of the project timeline is on the lead time of the sensors.

Reports and Channels of Communications



Bill of Materials – Water & Power Monitoring

Sl No	Item Name & Description	Cost (INR)/unit	Vendor identified	Lead Time	Units required
1	**Digital Flow Meter**	**800.00**	Seeedstudio (China)	TBD	3
2	**Water level sensor**	**10,000.00**	Seeedstudio (China)	TBD	1
3	**Smart Energy Meter**	**1,600.00**	Techno Meters & Electronics	2 days approx.	3
4	**RS-485 to Ethernet Converter**	**20,000.00**	Moontrack Systems	2-3 days approx.	TBD
5	**RJ45 Cable (25 m)**	**300.00**	Local Vendor	1 day	TBD
6	**Miscellaneous Items (Electrical Wiring, Casing, Power source)**	**Depends on Environment**	Local Vendor	1 week	TBD

Note:

- Exact number of units required and installation details will be updated during the requirement & design phase of the project as it depends on the distance between the facilities.
- Actual cost may vary at the time of placing the order. Any change in price will be handled by the client. Quantity of items will depend on the need confirmed by the client.

Bill of Materials – Vehicle Parking & Environment Monitoring

Sl No	Item Name & Description	Cost (INR)/unit	Vendor identified	Lead Time	Units required
1	**IP Camera**	**4,000.00**	Local Vendor	1 day	2
2	**Air Quality Index Sensor**	**22,000.00**	Robu.in (Brand: Adafruit)	12 days	1
3	**Wind Speed sensor**	**5,000.00**	Robu.in (Brand: Generic)	12 days	1
4	**Temperature & Humidity Sensor**	**4,000.00**	Seeedstudio (China)	TBD	1
5	**Rainfall Sensor**	**4,000.00**	Seeedstudio (China)	TBD	1
6	**RS-485 to Ethernet Converter**	**20,000.00**	Moontrack Systems	2-3 days approx.	TBD
7	**RJ45 Cable (25 m)**	**300.00**	Local Vendor	1 day	TBD
8	**Miscellaneous Items (Electrical Wiring, Casing, Power source)**	**Depends on Environment**	Local Vendor	1 week	TBD

Note:

- Exact number of units required and installation details will be updated during the requirement & design phase of the project as it depends on the distance between the facilities.
- Actual cost may vary at the time of placing the order. Any change in price will be handled by the client. Quantity of items will depend on the need confirmed by the client.

Bill of Materials – Sewage Treatment Plant

Sl No	Item Name & Description	Cost (INR)/unit	Vendor identified	Lead Time	Unit required
1	**STP Sensor - Ph Sensor**	**10,000.00**	Seeedstudio (China)	TBD	1
2	**Turbidity Sensor**	**2,000.00**	Seeedstudio (China)	TBD	1
3	**TDS Sensor**	**10,000.00**	Seeedstudio (China)	TBD	1
4	**COD/BOD Sensor**	**7,50,000.00**	Shanghai Boqu Instruments (China)	TBD	1
5	**RS-485 to Ethernet Converter**	**20,000.00**	Moontrack Systems	2-3 days approx.	TBD
6	**RJ45 Cable (25 m)**	**300.00**	Local Vendor	1 day	TBD
7	**Miscellaneous Items (Electrical Wiring, Casing, Power source)**	**Depends on Environment**	Local Vendor	1 week	TBD

Note:

- Exact number of units required and installation details will be updated during the requirement & design phase of the project as it depends on the distance between the facilities.
- Actual cost may vary at the time of placing the order. Any change in price will be handled by the client. Quantity of items will depend on the need confirmed by the client.

Sensor Details & Specifications – Water Resource Management (1/2)

Sl No:	Water Sensor	Specifications	Data Communication
1	Digital Flow Meter Sensor	• Mini. Working Voltage: DC 4.5V • Max. Working Current: 15mA (DC 5V) • Working Voltage: DC 5V~24V • Flow Rate Range: 1~30L/min • Flow Pulse: F(Hz)=(5.0*Q)±3% Q=L/Min • Load Capacity: ≤10mA (DC 5V), • Operating Temperature: 80 celsius • Liquid Temperature: 120 celsius • Operating Humidity: 35%～90%RH • Water Pressure: 1.75MPa • Storage Temperature: -25～+ 80℃ • Storage Humidity: 25%～95%RH • Weight G.W 22.5g • Battery Excluded • Price: ~ ₹800 approximately	Communication will be through wired connection. RS485 protocol will be used.

Sensor Details & Specifications – Water Resource Management (2/2)

Sl No:	Water Sensor	Specifications	Data Communication
2	Water Level Sensor	• Product Name: Industrial Liquid Level Sensor MODBUS RS485 Aviation Connector • Strong anti-interference and long-term stability • Anti-corrosion material, excellent anti-corrosion performance, and durable • Anti-blocking design, easy to clean • Modbus-RTU RS485 protocol, it can be used with a display device, PLC, inverter, recorder, and other instruments • The shell is made of stainless steel and durable, and with waterproof cable, safe to use • Price: ~ ₹10,000 approximately	RS485 Communication

Sensor Details & Specifications – Power Resource Management

Sl No:	Device Name	Data Communication
1	Smart Energy Meter	• Single Techno RS 232 Port Energy Meter 1 Phase, 240 • Phase: Single • Brand: TECHNO • Model Name/Number: TMCB012 RS 232 • Voltage: 240V • Usage/Application: ALL • Version Of Communication: RS 232 PORT • Type: Digital • Price: ~₹ 1,600 approximately

Sensor Details & Specifications – Sewage Treatment Plant (1/3)

Sl No:	STP Sensor	Specifications	Data Communication
1	pH Sensor	• Wide-range power supply: 3.6V ~ 30V • Robustness: suitable to be immersed in soil or water for a long time • Maintenance-Free: advanced junction design, no clogging • Durable: anti-corrosion, automatic temperature compensation • User-friendly: Easy to install and integrate • Price range: ~ ₹10,000 approximately	Universal protocol: MODBUS RS-485 or 4~20mA current
2	Turbidity Sensor	• Low power consumption • Small size: 2.0cm x 4.0cm Grove module • Only 3 pins needed, save I/O resources • Easy to use: Grove connector, plug and play • Output mode optional, support analog output and digital output • Operating Voltage: 3.3V/5V DC • Output Interface: Analog/Digital • Connector: 1 Grove, 1 power interface • LEDs: 1 power LED, 1 signal LED • Switch: 1 A-D toggle switch • Dimensions: 20x40 mm • Price Range: ~ ₹2,000 approximately	Serial Communication

Sensor Details & Specifications – Sewage Treatment Plant (2/3)

Sl No:	STP Sensor	Specifications	Data Communication
1	TDS Sensor	• High performance: high accuracy, fast response, good repeatability • Wide-range power supply: 3.9V ~ 30V • Robustness: suitable to be immersed in water for a long time • Durable: anti-corrosion, automatic temperature compensation • User-friendly: Easy to install and integrate • Output Interface: Analog Voltage 0-2V (Output resistance ~0ohm), RS485 Modbus-RTU • Power Supply: 3.9-30V/DC • Power Consumption (Idle): 40mA@24V DC • Power Consumption (Max): 80mA@24V DC • Start-up Time: < 2 seconds • Temperature Measurement: Range: -40~80°C • Price: ~ ₹10,000 approximately	Universal protocol: MODBUS RS485, 0-2V

Sensor Details & Specifications – Sewage Treatment Plant (3/3)

Sl No:	STP Sensor	Specifications	Data Communication
1	COD & BOD Sensor	• Measurement Principle: Attenuation, Transmission • Range: 0-2000 mg/L • Measurement Technology: Light Source: 2 LED(254nm, 530nm) • Detector: Photo diode + Filter • Turbidity Compensation: at 530 nm • Optical path : 1mm,2mm,5mm,10mm,50mm • T100 Response Time: 4s • System Compatibility: Modbus RTU • Power Consumption: <- 1W • Sample Temperature: 2 to 40 Degree C I ~+36 Degree F to +104 Degree F • Price Range: ~ ₹7,50,000 approximately	Serial Communication

Sensor Details & Specifications – Environment Monitoring & Vehicle Parking – 1/3

Sl No:	Other Sensors	Specifications	Data Communication
1	Camera (Vehicle Parking)	• IP Cameras • Starting Price: ~ ₹4,000 onwards/ unit	Direct Communication through IP address
2	Air Quality Index Sensor (Environment Monitoring)	• Adafruit SGP40 Air Quality Sensor Breakout – VOC Index – STEMMA QT/Qwiic • Circuit: SGP40 • Supply voltage: 3 V to 5 V • Communication interface: I2C • I2C communication interface address: 0x59 • VOC Measuring range: 0 ppm to 1000 ppm • VOC index value Measuring range: 0 to 500 • Connectors: STEMMA QT / Qwiic • Price: ~₹2200.00/ piece approximately	I2C Communication

Sensor Details & Specifications – Environment Monitoring & Vehicle Parking – 2/3

Sl No:	Other Sensors	Specifications	Data Communication
3	Wind Speed Sensor (Environment Monitoring)	• Wind Speed Sensor Current Type(4 to 20mA) Anemometer Kit (Waterproof & Industrial) • The mode of its output signal:4 to 20mA • supply voltage: DC 12-24V. • Power consumption: MAX≤0.3W. • Start wind speed ： 0.4-0.8m/s. • Effective measurement range:0-30m/s • Transmission distance (m):< 1000 m • Price: ~ ₹5,000 approximately	Serial Communication
4	Temperature and Humidity Sensor	• Temperature-Humidity Sensor-AF5485 (Encased RS485) • high performance industrial network-based temperature and humidity transmitter. • Price: ~ ₹4,000 approximately	RS 485 Communication

Sensor Details & Specifications – Environment Monitoring & Vehicle Parking – 3/3

Sl No:	Other Sensors	Specifications	Data Communication
5	Rainfall Sensor	• Industrial-Grade Optical Rain Gauge RG-9 Rain Sensor • Detects the size of raindrops and provides information on rain intensity to the users. • It features easy-installation and maintenance-free, suitable for applications in weather and climate studies, hydrological network monitoring, agriculture, and other scenarios that need monitoring rainfall. • Price: ~ ₹4,000 approximately	Serial Communication

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Connecting Intelligence and Information

Naico Information Technology Services (P) Ltd
Office No. O405B, 4th Floor, SCK 01,
SmartCity Kochi, Kerala, India
Pin: 682042

+91 484 4060130
getinfo@naicoits.com
www.naicoits.com

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