**Environmental Monitoring**

**ABSTRACT:**

Environmental monitoring describes the processes and activities that need to take place to characterize and monitor the quality of the environment.

Environmental monitoring is used in the preparation of environmental impact assessments, as well as in many circumstances in which human activities carry a risk of harmful effects on the natural environment.

In all cases, the results of monitoring will be reviewed, analyzed statistically, and published.

The design of a monitoring program must therefore have regard to the final use of the data before monitoring starts.

Environmental monitoring includes monitoring of air quality, soils quality, water management etc...

**FLOWCHAT FOR AIR QUALITY:**



The use of multi-parameter air quality monitoring systems makes it possible to do a detailed level analysis of major pollutants and their sources.

These monitoring systems are important components in many smart city projects for monitoring air quality and for controlling the main pollutant concentrations in urban areas.

**WATER MANAGEMENT:**

During the past decade, water needs have increased unpredictably in India. Increasing demand of water supply has become a major challenge for the world. Wasteful usage of water, climatic changes and Urbanization has further depleted the resource. Conservation and management of the resource must be given utmost importance. In this paper, we present an IoT design for water monitoring and control approach which supports internet based data collection on real time bases. The system addresses new challenges in the water sector -flow rate measuring and the need for a study of the supply of water inorder to curb water wastage and encourage its conservation. We also measure the quality of water distributed to every household by deploying pH and conductivity sensors. The traditional water metering systems require periodic human intervention for maintenance making it inconvenient and often least effective.For shortcoming of the existing models for a ubiquitous usage of wireless systems for smart quality monitoring and communicate data wireless

**FLOWCHART FOR SMART WATER MANAGEMENT:**



ENVIRONMENTAL MONITORING

DATASETS:

# **ATTRIBUTES FOR ENVIRONMENTAL MONITORING PARAMETER**

A parameter is contextually declared with the parameter attribute by its specification in a PROCEDURE or ENTRY statement. The parameter should be explicitly declared with appropriate attributes. The PARAMETER attribute can also be specified in the declaration

# **UNITS**

* Not vary with respect to place.
* Not vary with respect to time.
* Be of Convenient size.
* Easy to make a copy.
* Be properly defined.
* Reproduce easily.
* Be easy to measure things. etc.

**CATIONS**

Characteristics of cations : (i) Cations are positively charged. (ii) Cations are formed when an atom loses electrons from its valence shell to attain octet. (iii) Cations are smaller in size than parent atom.

(iv) The charge acquired by a cation is equal to the number of electrons lost by the valence shell

# **SYMBOLS**

A chemical symbol is a one- or two-letter designation of an element. Some examples of chemical symbols are O for oxygen, Zn for zinc, and Fe for iron. The first letter of a symbol is always capitalized. If the symbol contains two letters, the second letter is lower case.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | |  | |
| **Parameter** | **Unit** | **N01** | **N02** | | **N04** | |
| COD | ppm | 18 | 21 | |  | |
| hardness CaC03 | ppm | 397.5 | 353.5 | | 3 | |
| Si02 | | ppm | 2.88 | 3.84 | | | 4 |
| Organic nitrogen | | ppm | 3.27 | 0.54 | | | 1 |
| Total nitrogen | | ppm | 4.96 | 1.17 | | | 1 |
| Fe | | ppm | 0.062 | 0.017 | | | 0 |
| 804 | | ppm | 248.2 | 176.2 | | | 1 |
| NH3 | | ppm | 0.4 | 2.01 | | | 0 |
| Cl | | ppm | 251 | 340.8 | | | 37 |
| Nitrate | | ppm | 6 | 2.98 | | | 3 |
| Organic Phosphate | | ppm | 0.031 | 0.021 | | | 0 |
| Total Phosphorus | | ppm | 0.058 | 0.025 | | | 1 |
| TSS | | ppm | 1426 | 88 | | | 2 |
| Turbidity | | NTU | 18.52 | 43 | | | 45 |
| pH | | ppm | 8.5 | 8.2 | | | 26 |
| EC | | µS em | 1426 | 1620 | | | 1 |
| Temperature | | OC | 14 | 13 | | | 11 |
| BOD5 | | ppm | 3.2 | 3.5 | | | 08 |
| DO | | ppm | 8 | 9.8 | | | 34 |
| Springs name | | 7.3 | 1182 3200 | | 3117 84 2.14 | | |
| tfaatook -2 | | 7.4 | 1064 2900 | | 2790 74 1.9 | | |
| laan-3 | | 7.2 | 944 2561 | | 2390 72 1.9 | | |
| Al- rohbaan -4 | | 7.2 | 986 2390 | | 2203 73 1.9 | | |
| Al-hiaiatheea -5 7.8 | | | 1001 2320 | | 2237 | | 54 1.4 |
| M-rehameah -6 7.6 | | | 1276 2690 | | 2412 | | 41 1.03 |
| Al-iseaah-7 7.6 | | | 1245 2864 | | 2710 | | 48 1.2 |
| Al-assaweed -8 7.4 | | | 1387 2813 | | 2931 | | 56 1.4 |
| Al-ruhhba -9 7.3 | | | 1681 2890 | | 2701 | | 44 1.1 |
| Rweez -10 7.4 | | | 1512 2864 | | 2682 | | 46 1.2 |
| Average 7.4 | | | 1228 2759 | | 2597 | | 59 |

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|  | **To convert ppm ‘as the ion’ to ppm ‘as CaC03’ mulit** | | | |
| 0 | **Cations** | symbol | values | T |
| 16.5 | Aluminum | Al3\* | 5.55 | pH |
| .13 | Ammonium | NH4\* | 2.78 | EC |
| 1.26 | Barium | Ba2\* | 0.73 | SS |
| .12 | Cadmium | Cd2\* | 1.78 | MA l |
| .03 | Calcium | Ca2\* | 2.5 | Cl |
| 12.8 | Chromium | Cr3\* | 2.89 | NH3-N |
| .34 | Copper | Cu2\* | 1.57 | N03-N |
| 7.01 | Ferric (Iron) | Fe3\* | 2.69 | DO |
| .14 | Ferrous (Iron) | Fe2\* | 1.79 | Pv |
| .14 | Hydrogen | H\* | 50 | BODs |
| .67 | Lead | Pb2\* | 0.48 | T |
| 66 | Magnesium | Mg2\* | 4.1 | pH |
| 6 | Nickel | Ni2\* | 3.16 | EC |
| 8.1 | Potassium | K\* | 1.28 | SS |
| 730 | Silver | Ag\* | 0.93 | MA l |
| 10 | Sodium | Na\* | 2.18 | Cl |
| 4.4 | Zinc | Zn2\* | 1.53 | NH3-N |
| 8.6 | Copper | Cu2\* | 11.26 | N03-N |
| 457 19.8 | 173 14.2 | 188 9.4 | 952 26. | 660 13.7 |
| 348 15.1 | 91 7.4 | 276 13.8 | 868 24. | 548 11.4 |
| 382 16.6 | 76 6.3 | 252 12.6 | 588 16. | 560 11.7 |
| 203 8.8 | 57 4.7 | 301 15 | 462 13 | 785 16.3 |
| 278 12.1 | 46 3.8 | 326 16.3 | 462 13 | 830 17.3 |
| 263 11.4 | 196 16.2 | 188 9.4 | 380 10. | 1188 24.7 |
| 335 14.6 | 213 17.5 | 152 7.4 | 546 15. | 1226 25.5 |
| 266 | 251 20.6 | 143 7.1 | 714 20. | 970 20.2 |
| 271 11.9 | 342 28.2 | 112 5.6 | 350 | 1765 36.8 |
| 266 | 319 26.2 | 131 6.6 | 392 | 1539 32.1 |
| 307 | 176 | 207 | 571 | 1007 |

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|  | | |  |  | |  | |  | |  | |  | |
|  |  | -0.734 | 0.539 |  | -0.238 |  | 0.075 |  | 0.018 |  | 0.0 | |  |
|  | -0.088 | 0.061 |  | -0.246 |  | 0.472 |  | 0.032 |  | -0. | | |
|  | -0.821 | 0.312 |  | -0.067 |  | 0.079 | -0.203 | |  | -0. | | |
|  | 0.644 | 0.575 |  | -0.264 | -0.003 | |  | 0.149 |  | 0.2 | |  |
|  | -0.463 | -0.380 |  | 0.357 |  | 0.083 |  | 0.682 |  | 0.0 | |
|  | -0.183 | 0.372 |  | 0.646 | -0.349 | | -0.028 | |  | 0.3 | |
|  | 0.097 | 0.565 |  | 0.641 | -0.037 | |  | 0.007 |  | -0. | | |
|  | 0.029 | -0.378 |  | -0.163 | -0.775 | | -0.096 | |  | 0.0 | |  |
|  | 0.659 | -0.623 |  | 0.113 |  | 0.067 | -0.017 | |  | -0. | | |
|  | 0.524 | 0.675 |  | 0.061 | -0.120 | |  | 0.096 |  | -0. | | |
|  | 0.467 | -0.176 |  | 0.539 |  | 0.421 | -0.295 | |  | 0.2 | |  |
|  | -0.734 | 0.539 |  | -0.238 |  | 0.075 |  | 0.018 |  | 0.0 | |
|  | -0.088 | 0.061 |  | -0.246 |  | 0.472 |  | 0.032 |  | -0. | | |
|  | -0.821 | 0.312 |  | -0.067 |  | 0.079 | -0.203 | |  | -0. | | |
|  | 0.644 | 0.575 |  | -0.264 | -0.003 | |  | 0.149 |  | 0.2 | |  |
|  | |  |  | |  | |  | |  | | |
|  | -0.463 | -0.380 |  | 0.357 |  | 0.083 |  | 0.682 |  | 0.0 | |
|  | -0.183 | 0.372 |  | 0.646 | -0.349 | | -0.028 | |  | 0.3 | |
|  | 0.097 | 0.565 |  | 0.641 | -0.037 | |  | 0.007 |  | -0. | | |
|  | 0.029 | -0.378 |  | -0.163 | -0.775 | | -0.096 | |  | 0.0 | |  |
| 116 1.9 | | 25 |  | 0.641 | -0.037 | |  | 0.007 |  | -0. | | |
|  | |  | |  | |
| 45 1.5 | | 26 |  | -0.163 | -0.775 | | -0.096 | |  | 0.0 | |  |
|  | |  | |  | |
| 116 1.9 | | 26 |  | 0.113 |  | 0.067 | -0.017 | |  | -0. | | |
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| 116 1.9 | | 25.5 |  | 0.061 | -0.120 | |  | 0.096 |  | -0. | | |
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| 140 2.3 | | 26 |  | 0.539 |  | 0.421 | -0.295 | |  | 0.2 | |
|  | |  | |  | |
| 110 1.8 | | 26.5 |  | -0.238 |  | 0.075 |  | 0.018 |  | 0.0 | |
|  | |  | |  | |
| 122 1.99 | | 27 |  | -0.246 |  | 0.472 |  | 0.032 |  | -0. | | |
|  | |  | |  | |  | | |  |
| 116 1.9 | | 26 |  | -0.067 |  | 0.079 | -0.203 | |  | -0. | | |
|  | |  | |  | |
| 109 1.8 | | 26 |  | -0.264 | -0.003 | |  | 0.149 |  | 0.2 | |  |
|  | |  | |  | |
| 116 | | 25.6 |  | 0.357 |  | 0.083 |  | 0.682 |  | 0.0 | |
|  | |  | |  | |
| 109 | | 25 |  | 0.646 | -0.349 | | -0.028 | |  | 0.3 | |
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| 84 | 0.182 | 0.023 | -0.037 | 0.170 | -0.191 | -0.238 | 0.075 | 0.018 |
| 041 | -0.035 | 0.113 | 0.006 | 0.013 | 0.038 | -0.246 | 0.472 | 0.032 |
| 028 | 0.206 | -0.160 | 0.304 | -0.065 | 0.103 | -0.067 | 0.079 | -0.203 |
| 51 | 0.066 | 0.110 | 0.052 | 0.158 | 0.162 | -0.264 | -0.003 | 0.149 |
| 85 | 0.179 | -0.025 | 0.016 | -0.015 | 0.026 | 0.357 | 0.083 | 0.682 |
| 23 | -0.274 | -0.029 | 0.124 | 0.032 | -0.032 | 0.646 | -0.349 | -0.028 |
| 450 | 0.095 | 0.213 | 0.032 | 0.035 | 0.015 | 0.641 | -0.037 | 0.007 |
| 26 | 0.307 | 0.114 | -0.015 | 0.003 | 0.014 | -0.163 | -0.775 | -0.096 |
| 161 | 0.023 | -0.174 | 0.220 | 0.208 | -0.048 | 0.113 | 0.067 | -0.017 |
| 091 | 0.131 | -0.349 | -0.184 | -0.030 | 0.009 | 0.061 | -0.120 | 0.096 |
| 98 | 0.316 | 0.041 | -0.060 | -0.041 | -0.026 | 0.539 | 0.421 | -0.295 |
| 84 | 0.182 | 0.023 | -0.037 | 0.170 | -0.191 | -0.238 | 0.075 | 0.018 |
| 041 | -0.035 | 0.113 | 0.006 | 0.013 | 0.038 | -0.246 | 0.472 | 0.032 |
| 028 | 0.206 | -0.160 | 0.304 | -0.065 | 0.103 | -0.067 | 0.079 | -0.203 |
| 51 | 0.066 | 0.110 | 0.052 | 0.158 | 0.162 | -0.264 | -0.003 | 0.149 |
| 85 | 0.179 | -0.025 | 0.016 | -0.015 | 0.026 | 0.357 | 0.083 | 0.682 |
| 23 | -0.274 | -0.029 | 0.124 | 0.032 | -0.032 | 0.646 | -0.349 | -0.028 |
| 450 | 0.095 | 0.213 | 0.032 | 0.035 | 0.015 | 0.641 | -0.037 | 0.007 |
| 26 | 0.307 | 0.114 | -0.015 | 0.003 | 0.014 | -0.163 | -0.775 | -0.096 |
| 450 | 0.095 | 0.213 | 0.032 | 0.035 | 0.015 | 0.641 | -0.037 | 0.007 |
| 26 | 0.307 | 0.114 | -0.015 | 0.003 | 0.014 | -0.163 | -0.775 | -0.096 |
| 161 | 0.023 | -0.174 | 0.220 | 0.208 | -0.048 | 0.113 | 0.067 | -0.017 |
| 091 | 0.131 | -0.349 | -0.184 | -0.030 | 0.009 | 0.061 | -0.120 | 0.096 |
| 98 | 0.316 | 0.041 | -0.060 | -0.041 | -0.026 | 0.539 | 0.421 | -0.295 |
| 84 | 0.182 | 0.023 | -0.037 | 0.170 | -0.191 | -0.238 | 0.075 | 0.018 |
| 041 | -0.035 | 0.113 | 0.006 | 0.013 | 0.038 | -0.246 | 0.472 | 0.032 |
| 028 | 0.206 | -0.160 | 0.304 | -0.065 | 0.103 | -0.067 | 0.079 | -0.203 |
| 51 | 0.066 | 0.110 | 0.052 | 0.158 | 0.162 | -0.264 | -0.003 | 0.149 |
| 85 | 0.179 | -0.025 | 0.016 | -0.015 | 0.026 | 0.357 | 0.083 | 0.682 |
| 23 | -0.274 | -0.029 | 0.124 | 0.032 | -0.032 | 0.646 | -0.349 | -0.028 |

|  |  |
| --- | --- |
|  |  |
| 0.084 | 7.28 |
| -0.041 | 5.55 |
| -0.028 | 2.78 |
| 0.251 | 0.73 |
| 0.085 | 1.78 |
| 0.323 | 2.5 |
| -0.450 | 2.89 |
| 0.026 | 1.57 |
| -0.161 | 2.69 |
| -0.091 | 1.79 |
| 0.298 | 50 |
| 0.084 | 0.48 |
| -0.041 | 4.1 |
| -0.028 | 3.16 |
| 0.251 | 1.28 |
| 0.085 | 0.93 |
| 0.323 | 2.18 |
| -0.450 | 1.53 |
| 0.026 | 11.26 |
| -0.450 | 952 26.9 |
| 0.026 | 868 24.5 |
| -0.161 | 588 16.5 |
| -0.091 | 462 13 |
| 0.298 | 462 13 |
| 0.084 | 380 10.7 |
| -0.041 | 546 15.4 |
| -0.028 | 714 20.1 |
| 0.251 | 350 |
| 0.085 | 392 |
| 0.323 | 571 |

**EnvironmentalMonitoring Description:**

**A system for assessing environmental conditions in a specified location:**

Program(pyton code)

#include <WiFi.h>

#include <HTTPClient.h>

#include <DHT.h>

const char\* ssid = "Wokwi-GUEST";

const char\* password = "";

const char\* serverUrl = "https://smartenviron.free.beeceptor.com/smartenviron/";

#define DHTPIN 4

#define DHTTYPE DHT22

DHT dht(DHTPIN, DHTTYPE);

void setup() {

Serial.begin(9600);

Serial.print("Connecting to WiFi");

WiFi.begin("Wokwi-GUEST", "", 6);

while (WiFi.status() != WL\_CONNECTED) {

delay(100);

Serial.print(".");

}

Serial.println(" Connected!");

dht.begin();

}

void loop() {

float temperature = dht.readTemperature();

float humidity = dht.readHumidity();

if (!isnan(temperature) && !isnan(humidity))

{

HTTPClient http;

String postData = "temperature=" + String(temperature) + "&humidity=" + String(humidity);

http.begin(serverUrl);

http.addHeader("Content-Type", "application/x-www-form-urlencoded");

int httpResponseCode = http.POST(postData);

if (httpResponseCode > 0)

{

Serial.print("HTTP Response code: ");

Serial.println(httpResponseCode);

Serial.println("Data sent to Beeceptor.");

}

else

{

Serial.print("Error in HTTP request. HTTP Response code: ");

Serial.println(httpResponseCode);

}

http.end();

}

else

{

Serial.println("Failed to read from DHT sensor!");

}

delay(60000);

}

**Libraries :**

WiFi

DHT22

HttpClient

Firebase ESP32 Client

FirebaseRealtime

Firebase ESP32 Clientibraries

Output :