**Project Design Phase-I**

**Proposed Solution Template**

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| Date | 19 September 2022 |
| Team ID | PNT2022TMID23204 |
| Project Name | **Real-Time River Water Quality Monitoring and Control System** |
| Maximum Marks | 2 Marks |

**Proposed Solution Template:**

Project team shall fill the following information in proposed solution template.

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| **S.No.** | **Parameter** | **Description** |
|  | Problem Statement (Problem to be solved) | This paper proposes a sensor based water quality monitoring system .the main aim is to develop a system for continuous monitoring of river water at remote places using wireless sensor networks with low power consumption,low cost,and high detection accuracy.to measures water parametrs such as ph,conductivity,dissolved oxygen,tubidivityetc. |
|  | Idea / Solution description | Current water quality monitoring system is a manual system with a monotonous process and is very time-consuming. This paper proposes a sensor-based water quality monitoring system. The system consists of several sensors which is used to measure physical and chemical parameters of the water. The main components of Wireless Sensor Network (WSN) include a microcontroller for processing the system, communication system for inter and intra node communication and several sensors. Real-time data access can be done by using remote monitoring and Internet of Things (IoT) technology. Data collected at the apart site can be displayed in a visual format on a server PC with the help of Spark streaming analysis through Spark MLlib, Deep learning neural network models, Belief Rule Based (BRB) system and is also compared with standard values. If the acquired value is above the threshold value automated warning SMS alert will be sent to the agent. The uniqueness of our proposed paper is to obtain the water monitoring system with high frequency, high mobility, and low powered. Therefore, our proposed system will immensely help populations to become conscious against contaminated water as well as to stop polluting the water. |
|  | Novelty / Uniqueness | The environment around consist of five key elements e.g.soil ,water,climate,natural vegetation and landforms among these water is the outmost crucial element for human life .it is also vital for human life .it is also vital for the presistance of other living habitaits .Whether it is used for drinking,domestic use ,and food production or recreational purposes and readily available water is the need for public health .So it is highly imperative for us to maintain water quality balance.Otherwise,it would severly damage the health of the humans and at the same time affect the ecological balance among other species Water pollution is foremost global problem which needs ongoing evaluvation and adaptation of water resource directorial principle at the levels of international down to individual wellsit has been studied that water pollution is the major cause mortalities and diseases worldwide |
|  | Social Impact / Customer Satisfaction | Domestic water is intended for human consumption for drinking and cooking purposes. The Bureau of Indian Standards (Central Ground Water Board, [2017](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR9)) provides details about acceptable limits of substances such as Aluminium, Ammonia, Iron, Zinc etc. Traditional water quality measurement involves manual collection of water at various locations, storing the samples in centralized location and subjecting the samples to laboratory analytical testing (Thinagaran et al., [2015](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR33); Vinod & Sushama, [2016](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR38); Pandian & Mala, [2015](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR23); Azedine et al., [2000](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR5); Offiong et al., [2014](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR22)). Such approaches are not considered efficient due to the unavailability of real time water quality information, delayed detection of contaminants and not cost effective solution. Hence, the need for continuous online water quality monitoring in highlighted in (Vijayakumar & Ramya, [2015](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR37); Niel et al., [2016](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR21); Theofanis et al., [2014](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR32); Bhatt & Patoliya, [2016](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR6); Poonam et al., [2016](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR25); Xin et al., [2011](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR42); Xiuli et al., [2011](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR43); Sathish et al., [2016](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR29)).  Smart water quality approaches have been considered for lake and sea water applications. For such applications, distributed wireless sensor networks are required to monitor the parameters over a larger area and send the data monitored to a centralized controller using wireless communication. Such applications normally monitor parameters such as chlorophyll (Francesco et al., [2015](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR12)), dissolved oxygen concentration (Christie et al., [2014](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR10); Anthony et al., [2014](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR4)) and temperature (Peng et al., [2009](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR24); Francesco et al., [2015](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR12); Christie et al., [2014](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR10)).  Aquaculture centers require water quality monitoring and forecasting for healthy growth of aquatic creatures (Goib et al., [2015](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR14); Gerson et al., [2012](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR13); Xiuna et al., [2010](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR44)). In (Gerson et al., [2012](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR13)) authors have developed biosensors using Arduino microcontroller to monitor animal behavioral changes due to aquatic pollution. The abnormal behavior of animals can be considered as an indication of water contamination. In (Xiuna et al., [2010](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR44)) authors have proposed a smart water quality monitoring system to forecast water quality using artificial neural networks. Extensive tests have been carried out for a period of 22 months at isolated local area network and the data has been transferred to internet using CDMA technology.  Water quality monitoring in distribution systems is challenging in the context of management of distributed wireless sensor networks (WSN). A water distribution network for monitoring chlorine concentration has been presented in (Eliades et al., [2014](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR11)). Solar enabled distributed WSN has been proposed in (Ruan & Tang, [2011](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR28)) for monitoring parameters such as pH, turbidity and oxygen density. Water at different sites is monitored in real-time using an architecture composed of solar cell enabled sensor nodes and base station. Flexibility, low carbon emission and low power consumption are the advantages of the method proposed in the paper. A combined system for water and air quality measurement is proposed in (Mitar et al., [2016](https://smartwaterjournal.springeropen.com/articles/10.1186/s40713-017-0005-y#ref-CR19)) using additional sensors for measuring air temperature and relative humidity. |
|  | Business Model (Revenue Model) | Essentially, hardware has been programmed using Arduino IDE. This software can be used with any Arduino board such as WeMos. Open Source Arduino (IDE) software makes it easy to write code and upload it to a board. It runs on Windows. The data collected are then archived in an online database losant. It is an open source software that facilitates researchers to record sensor data and convert it into useful content. Platform Dot.tech can be used to transmit data to the cloud from any device that allows the internet by configuring actions and reminders based on real-time data and releasing data values via visual tools. |
|  | Scalability of the Solution | Can be used to monitor the water quality of rivers,lakes . |