Groundwater Management System

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Abstract **- The management of groundwater resources for sustainable development is a challenging task in India because of its vast geographical extent (3287000 km2), where about 1250 million people live. As a result, the Country is facing scarcity of drinking water quite often. This situation compels to adopt management practices for the development of sustainable groundwater resources. The objective of the paper is to focus on need of adoption of appropriate management strategies for sustainable development of groundwater resources. In view of this the groundwater situation in India as reflected through published literature has been discussed, in which the causes of scarcity, aquifer situation, and groundwater assessment in India have been explained. Based on this study the future approach for groundwater management to achieve the objective of sustainable development has been suggested. This paper provides insight to all the controlling factors affecting groundwater resources in India. Based on this, suggestions for future implementation of water conservation programs have also been discussed. The present study shows that despite availability of ample groundwater resources the country faces drinking water scarcity quite often. This fact needs further analysis of scarcity situation to provide everlasting solution of problems related to groundwater.**

Index Terms **- Groundwater, Sustainability, Rainfall, Rainwater Harvesting, Management Model.**

I.INTRODUCTION

Groundwater is one of the natural resources that is used as water supply for the daily needs of residents, agricultures, industries, and others. The need for groundwater needs is certainly in line with the increase in population and development. It will continue to increase in the future to meet the needs, although the groundwater resources are intrinsically renewable, but the efforts in the utilization of groundwater resources should be through a method in which the groundwater pumping should be as optimal as possible while maintaining the continuity to maintain the balance of the environment. In the implementation of regional autonomy as stipulated in Law No. 32 of 2004, the regions have their autonomy in the management of ground water resources in their regions and are responsible to maintain environmental sustainability. It means that the implementation of groundwater management authority must be based on the principle of management of which source is the sustainable groundwater resources which can ensure the sustainable groundwater development.

Groundwater is a commodity plays a vital economic role, even in some regions, such role can be classified as a strategic factor. However, on the other hand, the overexploitation of groundwater resources has caused some problems result in negative impact on the surrounding environment, among others; land subsidence, reduced quantity of groundwater, degradation in groundwater quality, subsidence and saltwater intrusion into the equifer of groundwater. Complexity, natural characteristics and uncertainty of the ground water resources have led some researchers to propose some models of groundwater management based on uncertainty. Aguado and Remson (1974) have developed a model of water resources utilization from any location, with or without considering certain expenses. The problem in groundwater quality solved by using the "embedding" method is by maximizing the waste disposed in an area while maintaining standard quality of groundwater if the quantity of pumping and recharge have been preset and the handling of groundwater quality by maintaining certain gradient head. Furthermore, Gu and Dong, in 1998, make some changes in the policy regarding water quality, groundwater quantity and further strategy with an integrated approach that requires

mathematical modeling as a tool in the management of groundwater quality.
Therefore, there is a need of groundwater management to preserve its availability which means that the principles of benefit, balance and sustainability in the management of groundwater in groundwater resources can be sustainable.

II. REVIEW AND STUDIES

On 9th May 2020 Mr. Mallikarjun Sir uploaded a research paper in which he has taken the example of two areas on our country and compared the ground water level by using svm technique, in which he has discussed about the problems of the water level.
We have taken the idea from his research work; we are going to make a java software in which we can easily check and analyses the condition of ground water using the database of this project.
In this research's work the main points are: -
This article compared the groundwater level in North India (Greater Noida in Uttar Pradesh, India) and South.
India (Chittoor in Andhra Pradesh, India) regions. Especially, separating the two classes (data points), the effectiveness of algorithm is carried out by reduction of error rate, computed.
The augmented matrix H compared with diagonal matrix D to generate predicted data by using the novel approach of SVM-based binary prediction. In this model, the equations provide for determining the training data to predict the groundwater level. SVM-based binary prediction uses the two correlated functions such as ACF and PACF to reduce the error rate and provides the better prediction. The results of this study show that the novel machine learning algorithm SVM-based binary prediction provides a new approach com-pared normal SVM approach. The algorithm carried out the effective prediction results provides that Andhra Pradesh (south India region) will lack of groundwater compared to Uttar Pradesh (North India region) in future. Everyone has responsibility to increase the ground water level, reduce, reuse and recycle the water. A wash smart approach, increase of the native plants will be of immense help. The SVM-based binary prediction algorithm can be used for various applications such as face detection, image classification, handwritten recognition, Bio-informatics' etc.
From his researches we get the idea to make the software in which we can view or upload the dataset regarding the ground water management and help the peoples to manage the water problems in our country.

III. ALGORITHM

As we know, India is mainly an agriculture – based country and the economy, GDP and at a large, the progress of the country is hugely dependent on agriculture. But due to its vast geographical extent, the management of groundwater resources for sustainable development is a challenging task in India.
Therefore, we have developed our project to help in the maximum utilization of the available groundwater resources, and to help the Users, i.e., farmers with seasonal data of groundwater levels, so as to maximize their profits and agricultural output. Seasonal data of groundwater levels of their area would be available on the system and will assist them with the data to provide them with necessary information about the farming most beneficial and suited to that particular region. This will help the users as they will not have to be dependent on natural aids like seasonal rain for their farms. The assurity of their produce will help them maximize their profits and contribute on a larger scale to the progress of our country.

IV.CASE STUDY

For understanding the elaborate working of our project, we will look at a situational example of a particular Area in North India.
As we know, Bihar is mainly an agriculture – based state and the main occupation of the residents is farming. Thus, it can be safely said that agriculture affects the livelihood of a large percentage of the population. The crops grown mainly in these parts are Rice, Wheat, Maize, a host of Cereals, Sugarcane etc. The main sources of irrigation of the fields are pumping the water through Tube-Wells, Canals or Wells. Now the main source of water for these are through torrential rain or from rainwater harvesting, which is a very uncertain source. If the rainfall in the area is low, the farmers incur heavy losses on their crops and often run into debts.
To solve this problem and to remove the dependability of the farmers on uncertain sources like rainfall, we have come up with this project which will help the

farmers to utilize the available groundwater to the maximum of their output. The system will help the users with the data of their particular area, and will also suggest them the crops that can grow best in the available groundwater resources. For an area having low groundwater levels, the users will be suggested to go for crops that require less amount of water to grow (ex: - Legumes such as peas, lentils, beans, mustard or vegetables such as cauliflower and broccoli etc.). In a similar way, for a user residing in an area with high groundwater levels He/She will be suggested to grow crops that suit best the available conditions (ex: - Rice, Sugarcane, Cotton, Almonds, Wheat etc.). In this way the farmers have to be a lot less dependent on uncertain sources, and they can rely on the groundwater for the maximum output of their produce, thus ensuring a good profit on their crops.

V.WORKING

The working of the system is simple. The user will first visit the Welcome page of the Groundwater Management System. Her the user will have two options, one, if the user is a first-time visitor on the system, he/She will have to sign-up into the system using the required details to be asked by the system. Otherwise, if the user has already signed up before, he will have to log-in into the system using the ID-password that was created during the sign-up. The user will now have access to the main page of the system. Once on the main page, the user will just have to provide his location to the system, either manually or by allowing it to access his current location. After his location is accessible to the system, the user will be provided with the seasonal data of Groundwater levels of his area. Along with it, the system will also suggest a variety of crops suitable for that particular area, and also the proper methods to utilize the groundwater to its maximum capability. The system will also help the user with the information of the proper fertilizers and pesticides to maximize the output of the crops.

For example, a user in Bihar logins to the system, and after providing his location, finds out that the groundwater level of his area is quite high. Therefore, he can grow the crops that require high amounts of water to grow. In a similar way, if a user finds out that the groundwater level of his area is quite low, instead of planting crops with high water retention qualities, and depending upon natural sources that are uncertain, the user can simply plant crops that are best suitable to the area's groundwater conditions.

In this way, the system will help to minimize the losses incurred and will also remove their dependability from uncertain sources of irrigation and instead make best use of the available resources. Thus, making an assured profit on their agricultural produce.

VI.ARCHITECTURAL DESIGN

The working of the system is simple. The user will first go to the welcome page of Ground water management system. Here he/she will be given an option to either view / upload the data using Sign-Up option or enter an existing data by using Login option.

If the user does not have any account then they have to create a account after which they will be redirected to the login page to enter their details.

This will include a graph with pre rain and post rain. If the ground water level is greater than previous , then the remaining amount will be added to the level of next time and if the level is greater than previous, then the expected level will be calculated for next monts to warn the user about the ground water limit which will help in balancing out the nature.

VII.IMPLEMENTATION AND DESIGN OF MODULES

A. Welcome Module:

This module is used as a welcome page to which is configured as the face of the project. On this page we are given a choice to registering into an existing database using Login Button by having pre-made login credentials or to make a new database for a new user using Sign-Up Button.

B. Login Module:

This module will be used to enter an existing database with the help of pre-made login credentials. After entering the correct login credentials the user will move to the Ground water page where he/she can enter their data. It also contains the option to register in case there is not such database as entered.

C. Sign-up Module:

This module will be used to create a new database for new users by entering details such as username and password. After creating the username, the user will

be re-directed to the login page to enter the newly made login credentials and move towards the Ground water module.

VIII.TOOLS REQUIRED

A. SOFTWARE REQUIREMENTS:

- JAVA
- SQLite for Database
- Any IDE
- GIT
- Cloud Services (For Secure Storage of Data)

B. HARDWARE REQUIREMENTS

- Desktop Device
- 20MB Memory
- 2GB RAM
- PyQT 4.4 or above

C. COMPUTER

- Windows 8 or above
- 4GB RAM
- 20GB Memory
- Active Internet Connection

IX. FEASIBILITY

Feasibility study is a test of system proposal according to its workability, impact on the organization, ability to meet user needs and effective use of resources. The objective of feasibility study is not to solve the problem, but to acquire a sense of its scope. During the study, the problem definition is crystallized and aspects of the problem to be included in the system are determined, consequently costs and benefits are estimated with greater detail at this stage. The result of the feasibility study is a system formal proposal. This is simply a form of documenting or detailing the nature and scope of proposed solutions. The proposal summarizes what is known and what is going to be done. It is broadly divided into 3 main subcategories –

1. ECONOMIC FEASIBILITY
2. TECHNICAL FEASIBOLITY
3. OPERTIONAL FEASIBILITY

1.Economic Feasibility: Economic analysis is the most frequently used method for comparing the cost with the benefit or income that is expected from a developed system. A system can be developed technically and that will be used if installed must still be a good investment for the organization. In the economic feasibility, the development cost in creating the system is evaluated against the ultimate benefit derived from the new systems. Financial benefits must equal or exceed the costs.

2.Technical Feasibility: The feasibility center on the existing computer system (software, hardware) and to what extent it can support the proposed addition. The technical issue usually raised during the feasibility stage of the investigation includes the following:

- Does the necessary technology exist to do what is suggested?
- Do the proposed equipment have the technical capacity to hold the data required to use the new system?
- Will the proposed system provide adequate response to inquiries, regardless of the number or location of users?
- Can the system be upgraded if developed?

Are there technical guarantees of accuracy, reliability, ease of access and data security?

3.Operational Feasibility: Proposed projects are beneficial only if they can be turned out into an information system. That will meet the organization' s operating requirements. Operational feasibility aspects of the project are to be taken as an important part of the project implementation. Some of the important issues raised are to test the operational feasibility of a project includes the following:

- Is there sufficient support for the management from the users?
- Will the system be used and work properly if it is being developed and implemented?
- Will there be any resistance from the user that will undermine the possible application benefits?

This system is targeted to be in accordance with the abovementioned issues. Beforehand, the management issues and user requirements have been taken into consideration. So there is no question of resistance from the users that can undermine the possible application benefits. The well-planned design would ensure the optimal utilization of the computer resources and would help in the improvement of performance status.

X.COMPLETE WORKPLAN LAYOUT

SDLC Model – The software development life cycle used here is Waterfall Model. We can get back to any defined stage as per usage requirements.

XI.CONCLUSION

There is a need to generate spatial databases integrating all factors affecting groundwater recharge and withdrawal using remote sensing technique. In the absence of such databases, groundwater development plans would not be fruitful to have desired impact. The aquifer mapping at the micro-level/ local scale is a primary need before undertaking any water conservation program. The sustainable development of groundwater resources needs adoption of a holistic approach, which involves studying parameters related to groundwater and other collateral dataset, such as slope, geomorphology, lineament, soil, land use, etc. There is a need to have a long-term planning by considering future demand of irrigation and drinking water.

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