SuperGeo®
GIS Software & Solution

Groundwater Recharge Potential Evaluation Platform

Scenario

Water resource protection is one of the national policies; ground water protection, in particular, is the extremely essential task. Since 1991, Ministry of Economic Affairs, Taiwan has studied hydrogeology in nine groundwater areas, Hengchuan, and Penghu, in Taiwan and built up groundwater investigation wells. Therefore, Ministry of Economic Affairs gathered the hydrogeology data of Taiwan, built up hydrogeology monitoring system, hydrogeology database, and core repository. As a result, researchers can have an initial observation of numerous natural groundwater recharge areas.

However, if you would like to improve the accuracy of the delimiting of groundwater recharge area and the evaluation of recharge quantity, you not only need to have more detailed information and monitoring data but also integrate analysis of groundwater hydrograph and GIS technologies to create a groundwater recharge potential evaluation platform. Thus, the related data of each groundwater recharge area can be collected, and the accuracy of hydrogeology map of each groundwater area and evaluation of groundwater resource can be improved.

Solutions

Groundwater recharge potential evaluation platform, which applies SuperGIS Desktop and its extension - SuperGIS Spatial Analyst and SuperGIS Spatial Statistical Analyst, is the tool developed with Microsoft Access database and VB programming language. The platform is able to assist the staff in delimiting groundwater recharge areas. Groundwater recharge potential evaluation platform can simulate the information of each groundwater recharge area, like recharge rate, pumping rate, flow rate, recharge potential, water table, etc. Moreover, the platform employs Kriging and linear interpolation to map and visualize the point data so that the recharge capability of each location can be presented clearly. Therefore, the related staff can rapidly recognize the recharge potential difference in various locations.

Groundwater is an essential component of the hydrological cycle.

Solutions

- The project is developed with SuperGIS Desktop, SuperGIS Desktop Extensions, and Microsoft Access to help the staff delimit the groundwater recharge area.

Results

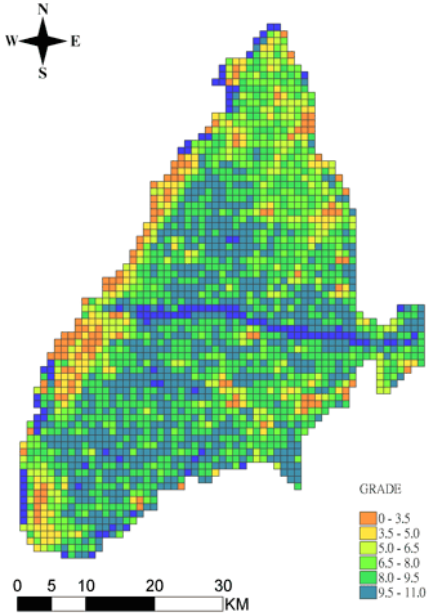
Groundwater recharge potential evaluation platform is a tool based on GIS technologies, collaborating database, and developed in VB programming language. With the tool, users can calculate the groundwater recharge area and the recharge capability of each location. Also, the visualized data can assist users in rapidly recognizing the recharge potential difference in various locations.

In terms of functions, groundwater recharge potential evaluation platform can be divided into Groundwater Hydrograph Recharge Evaluation and Groundwater Recharge Potential Evaluation.

1. Groundwater Hydrograph Recharge Evaluation: This evaluation extension applies the hydrograph changes of water table and tests the water pumped from the duplicate wells to evaluate the pumping rate, recharge rate, water storage variations, and water loss rate in the basin. Users can analyze the related data point by point and then cumulate the data to complete the data of the entire basin; or users can utilize the water storage rate of the entire basin to estimate the recharge rate, pumping rate, and water loss rate of the drainage area. The related data can be the reference for further research.
2. Groundwater Recharge Potential Evaluation: The purpose of the evaluation extension applies the 7 groundwater recharge factors, including land use, surface soils, relation between rainfall and water table change, annual average rainfall, water storage change per unit, permeability coefficient, and density of river system, to evaluate the groundwater recharge potential of a specific drainage area. Each range of recharge potential is 40 points, and the points can be used to estimate and map the groundwater recharge area of a drainage area.

Both of the evaluation extensions provide the two ways to input data, “created by database” and “created by users.” “Created by database” enables users to set the parameters, and Ground Recharge Potential Evaluation Platform will calculate and supplement the data with the data created in database. On the other hand, “Created by users” allows users to input the data in the fixed format, and the platform will be capable of simulating the calculation.

Groundwater Recharge Potential Evaluation Platform is based on groundwater hydrograph and groundwater recharge potential evaluation and collaborates with several databases, such as water table, rainfall, hydrogeologic parameters, etc. Meanwhile, the platform also applies GIS to estimate and map the groundwater recharge area. Consequently, it would be more convenient to estimate the groundwater area and improve the accuracy of groundwater hydrogeology map and groundwater resource.



The Groundwater Recharge Potential Evaluation function applies the 7 integral groundwater recharge factors to evaluate the groundwater recharge potential of a specific drainage area.

Results

- Groundwater recharge potential evaluation platform, based on GIS technologies, is a tool collaborating with databases and developed in VB programming language.
- In terms of functions, groundwater recharge potential evaluation platform can be divided into Groundwater Hydrograph Recharge Evaluation and Groundwater Recharge Potential Evaluation.

Software Used

SuperGIS Desktop

SuperGIS Spatial Analyst

SuperGIS Spatial Statistical Analyst

Microsoft Access

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