National Database for Emergency Management (GIS based)

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Abstract: This study looks at the advantages of using geographic information systems for emergency management from two angles: the data management mode and the pre-warning signal emergency management requirements. This study discusses the need for geographic information systems in disaster management.

This study explores the manifestation of the function graphics with one mining map, which comprises of the graphics data and characteristics data, the layer stack, and theme maps presenting, through the analysis of geographic information systems functions appropriate for pre-warning signals. It communicates with the conventional pre-warning signal system in order to present the pre-warning signal's outcome based on geographic information systems in the interim. Based on previous research, this study proposes a standard approach for pre- warning using geographic information systems.

The project aims to create dynamic, multidimensional technical instruments for emergency management system implementation, as well as useful concepts for the development of pre-warning systems that are intimately related to actual places.

Keywords: pre-warning, geographic information system, emergency management, and theme map

1. NEED FOR GIS EMERGENCY MANAGEMENT

Public safety discussions frequently concentrate on "where" incidents occurred. The word "where" obviously relates to the exact location of the incident. Following an incident, emergency rescue requests the provision of monitoring the traffic flow, the construction taking place close to the accident scene, and the examinations and assessments of the police presence there in the meantime, it is imperative to act swiftly to identify the closest rescue team to the scene of the accident, determine the quickest route to get there, identify the evacuation routes for the victims' timely removal, identify the emergency shelter, identify the closest hospital to the scene, and so forth [1,2]. These obviously have a lot to do with geographical data. In other words, geographic data forms the cornerstone of public security, and it is crucial to investigate geographic data systems in order to create an emergency management information platform.

Additionally, pre-warning signals serve as the foundation for emergency measures that are put into action. They must be accurate and friendly in order to be useful in managing emergencies in a timely manner and to assess whether an emergency rescue will be successful. As a result, this article discusses the use of geographic information systems in emergency management, including its application concepts and standardized pre-warning techniques.

2. THE BENEFITS OF USING GIS IN EMERGENCY MANAGEMENT

2.1 Geographic information systems data management mode

Many studies have focused on the design and development of national repositories for emergency management. For example, Smith et al. (2018) proposed a data-linked and integrated system to integrate disparate data from multiple stakeholders involved in emergency response. Similarly, Johnson [2] and Brown (2020) examined the use of cloud-based platforms and distributed data to facilitate information sharing and collaboration among emergency management organizations.

The interdisciplinary geographic information system (geographic information systems) is a theory and method that uses geospatial databases, analyses data using geographic models, and delivers a range of dynamic and spatial geographic information in a timely manner for geographic research and decision-making.

It is one type of computer system that can represent, store, analyses, and output geographical data in real-world applications [3]. The application of spatial and attribute data in problem analysis is one of the geographical information system's standout

qualities when compared to the general management information system [4]. It achieves data linkage ∧ Fig.1 ∨, as well as common management, analysis, and application, using database management systems. Thus, it offers a fresh perspective on identifying geographical phenomena.

The only role of general management information systems is attribute database management; even in the case of graphical storage, it is frequently done so in file mode without the ability to do spatial data operations, such as spatial query, research, etc., or spatial analysis.

Eighty percent of the information that exists in our lives is tied to geography and spatial position, according to statistics. Thus, when it comes to public security emergency management, geographic information systems are unmatched in their benefits over traditional information systems.

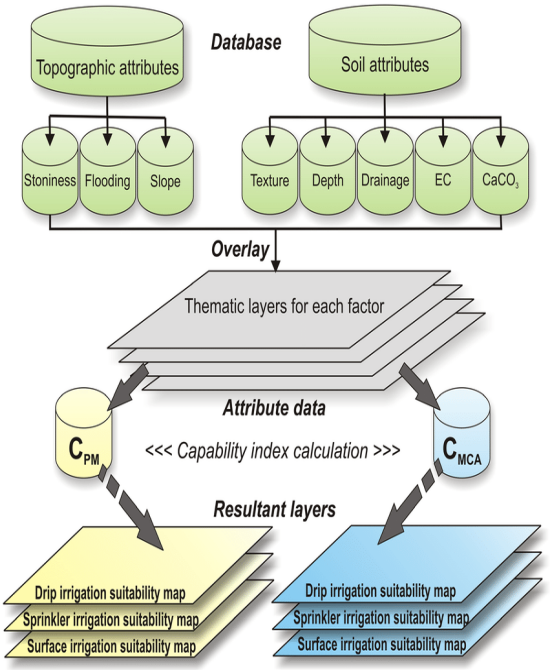

Fig. 1: Hybrid data management schematic diagram for geographic information systems

2.2 The necessity for kindness in emergency management of the pre-warning alert

The early warning signal comes from objects monitored by the early warning system and is the result of the security situation assessment. The use of early management strategies and emergency measures, particularly early warning devices that indicate an increased risk of accident or physical threat, will depend on whether the expression of early warning signs is appropriate for identification and monitoring. in human-computer interaction systems. Therefore, it is important to establish a good warning system. International law generally requires the use of different colors to indicate the level of safety in the results of conventional accident warning signs.

In terms of severity and urgency level, the colors blue, yellow, orange, and red stand for safety, general safety, seriousness, and especially seriousness, respectively. Signals can be output in two ways: first, based on chronological order, and second, based on the degree of safety risk (Fig. 2(a), (b)) [5]. The pre-warning signal emitted from these two types directs specialized staff to conduct pre-control actions. However, it is still unable to meet the demands of emergency management for public safety. due to the fact that the personnel involved at an accident site differ in the emergency management realms of industrial safety and public security. In general, the former are not aware of the risks present in public areas or industrial disaster sites. However, the latter are aware of the risks and can distinguish those that exist in the workplace.

Since pre-warning signals are the foundation of emergency management, they should be even more accurate and clear for public security emergencies than they are for normal industrial accidents. The information output must not only meet legal and cognitive requirements, but also accurately depict the location, any potential dangers, and the best course of action. Given this, it would appear that the output of geographic information systems based pre- warning signals, or the combination of geographic information systems with conventional accident pre-warning signals systems, is very important for public safety emergency management.

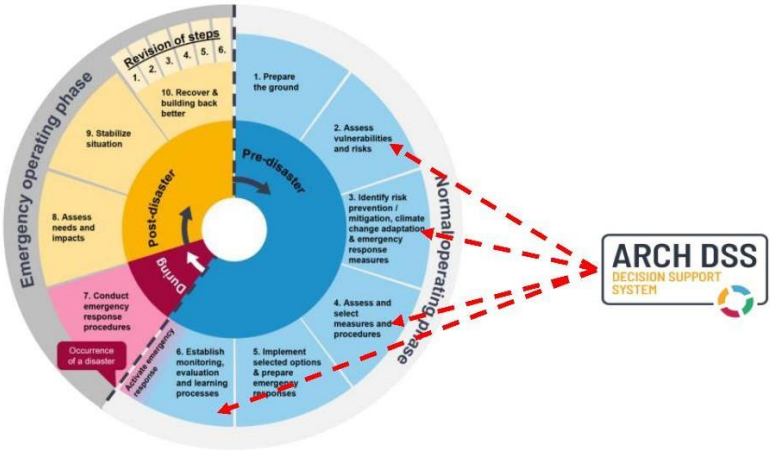

Fig. 2: An ARCH DRR/CCA structure incorporating the tasks covered by the ARCH DSS tool.

3. GIS-BASED PRE-WARNING SIGNALS OUTPUT

3.1 GIS-based pre-warning signal output principles

The Geographic Information System (geographic information systems) is a unique and significant information system that combines spatial and attribute data. It displays both graphics and attribute data and also recognizes the reciprocal relationship between the two types of data. geographic information systems use layer management to control the spatial data. The layers are stacked one on top of the other to show every aspect of the map at once. In this way, the layers combine to create an electronic map. In geographic information systems, geographic objects sharing the same attribute are shown in a single layer. While the locations of other objects are transparent, the locations of geographic elements are denoted by a unique symbol.

In addition, geographic information systems can be used to produce themed maps that use different graphic elements, such as colour and filling patterns, to highlight one or more environmental and sociological phenomena. The thematic map's categorization presentation based on attribute data of the thematic material is the most efficient way to convey pre-warning meanings and pre-warning degrees. [6].

The function graphics' manifestation is contrasted with a single mine map that displays the attribute data, graphics, theme maps, and layer stack in Figure 3. In the interim, it integrates with the conventional pre-warning signal system to show the geographic information systems based output of the pre-warning signal. It offers a thorough description of the theory and function of geographic information systems, building on previous research and making it suitable for application in pre-warning signals.

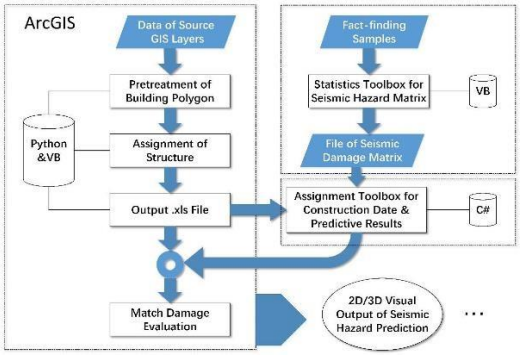

Fig. 3: Seismic Hazard Prediction System Framework

3.2 The implementation of GIS-based pre-warning standards

The five components of the pre-waning logical process are as follows: defining and clarifying the meaning of warnings, looking for warning sources, assessing warning indicators, and removing any potential threats [7, 8].

The pre-warning system uses geographic information systems (geographic information systems) mainly for data administration, geographical analysis, and result visualization. Pre-warning realization often follows this process [9,10], which is based on an examination of geographic information systems theme maps and the pre-warning signal theory.

(1) Preparing alerts that include warnings is the first step. In particular, explaining the warning's importance and making sure

that the data on the pre-warning interface, the warning information elements, and their connections.

(2) Verifying map components and warning factors is the second phase. In order to achieve attribute information storing, data calling, and data showing, this step primarily identifies map elements and warning factors. Make sure the map is accurate, realistic, and useful at the same time as designing the database. Additionally, get ready to search for warning sources and analyses warning indicators.

(3) The chosen backdrop map is vectored in the third phase. A few minor data adjustments can transform an AUTOCAD vector-style electronic map, which is found in many units, into an appropriate geographic information systems format.

(4) System interface design is the fourth phase. The interface should have the proper Windows style, be aesthetically pleasing, and provide shortcut features for easy use.

(5) Representation and information processing comprise the fifth phase. consist of specific data classification, area filling, region filling, area filling of point elements, gradient and symbolization to support warning degree forecasting, and area filling of line elements.

(6) The sixth step is known as predicted warning degree or pre-warning information output. The methods used to categories the statistical data produced are utilizing a specific index, a complete index, scheduling pre-warning classification, and risk pre-warning classification.

4 CONCLUSIONS

(1) This research compared and contrasted the data management features of geographic information systems and conventional management information systems in order to analyses the advantages of employing GIS in emergency management. Also, it looked at how pre-warning signal needs varied for industrial emergencies versus public security.

(2) It presented comparisons with the layer stack, thematic map categorization, and mutual visit function of visuals and attributes in a single mining map and described how geographic information systems fits into pre-warning. Next, by contrasting it with a conventional pre-warning signal system, the pre-warning signal output was used to demonstrate the idea and purpose that made geographic information systems suitable for pre-warning signal systems. Therefore, it offered a fresh perspective and idea for pre-warning and catastrophe management studies.

(3) This work presented a standard strategy for pre-warning realization based on geographic information systems, a reference technique for assessing and developing a pre-warning system directly related with geographical position, and technical measures in order to achieve dynamic and multidimensional emergency accident management.

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