

Studying on Flood Damage Assessment System of Hunhe River Basin

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Abstract: It is necessary to establish an evaluation system to calculate flood disaster losses quickly, accurately and wholly for effectively reducing or avoiding flood losses and promoting correctness and validity of flood control and regulation decision of Hunhe River. From the view of flood control and disaster reduction of Hunhe River, this paper designs flood damage evaluation system of Hunhe River basin and also describes its functions and characteristics. [Nature and Science. 2005;3(2):75-78].

Key words: Hunhe River; flood control and regulation decision; flood disaster evaluation

Introduction

Hunhe River is the larger river in the middle part of Liaoning province of China, and its drainage area is 11481 km², which is great important for economic development of Liaoning province. However, Hunhe River is also the region with frequent flood. In history, many extraordinary flood had ever occurred here, especially the flood in 1995, which caused a great damage for people's lives and properties. Inundated areas caused by the flood in 1995 is 1356 km², and stricken population attains to 0.433 million, making up 62.6% of the total population in floodplain, and submerging farmland is 0.0946 million hm², making up 80.5% of the total farmland in floodplain. The huge flood damage losses not only bring about economic waste, but also greatly influence people's mentality health in stricken area. Therefore, evaluating system assessing flood losses quickly and accurately is urgently needed to assist flood control regulation decision, update flood pre-scheme and make full play of structural measures and non-structural measures in order to avoid or reduce flood losses. This system will promote the healthy and stable development of economy and society of the nation.

Aiming at the characteristics (namely: extensive

influencing area, long consistent time and severe losses) of flood damage losses in Hunhe River, and stressing on the basis of flood losses mechanism, flood damage assessment system of Hunhe River is developed. This system can act as an effective sustentation for flood control decision support system of Hunhe River and service the whole process of flood control regulation decision.

1 Aim and Principles of System Development

Aim of system development is to offer a scientific, rational and reliable flood damage assessment system. The following principles should be insisted in system: (1) practicality, credibility, stability, expand; (2) having favorable user interface and mutual accomplish between human and computer; (3) the design of module must be rational, it not only guarantees the data transformation quickly and effectively among modules in system, but also ensures transformation of other modules; (4) self-governed database is owned and rationally accepted in system; (5) realizing effective flood damage assessment; (6) obligating fetches for other systems.

2 General Design

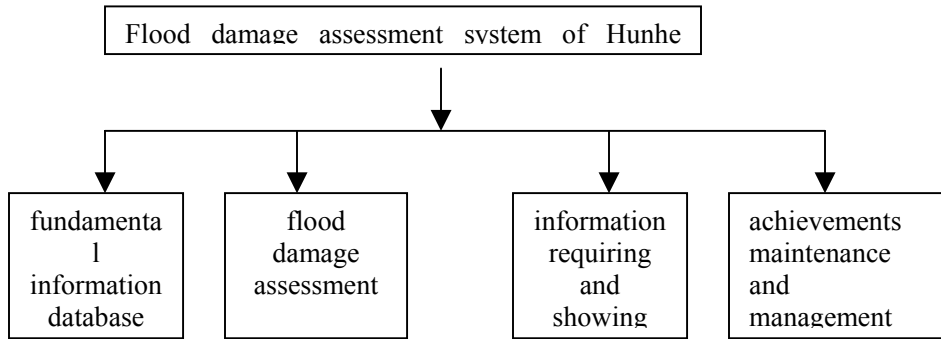


Figure 1. System configuration

2.1 System configuration

The system includes four parts: (1) fundamental information database; (2) flood damage assessment model; (3) information requiring and showing; (4) achievements maintenance and management (Figure 1).

2.2 System function

2.2.1 Fundamental database

There are settlement and properties in floodplain which is the reason why the flood can cause great damage, when flood occurs, it will do harm to human. So, flood disaster is the process in which flood acts on human's society under certain natural geography condition, such as natural factors, environmental factors and social factors. When studying on flood disaster, we must aim at these three factors seriously to achieve overall flood disaster assessment. Thus, fundamental data should be included in fundamental database: flood characteristic data (begin and end time, lasting time, submerging time, velocity of flood flow, historical flood damage losses and its occurring times, various losses data, etc); geography information data in floodplain (topography, physiognomy, soil, vegetation, land utilization condition, administration district, river basin district, water project, etc); society and economy data (population, numbers of houses, farmland area, total area, total national economic production value, fixed production value, industrial production value, agricultural production value, transportation and infrastructure condition, prevalence degree of flood

control and disaster reduction knowledge, etc).

For realizing dynamic interlinkage between user and data and for the convenience of update database timely, Access database is adopted to manage and maintain the whole data so as to provide with timely and accurately information for flood control decision.

2.2.2 Flood disaster losses assessment model

Flood disaster losses assessment model is a core of this system. Flood disaster losses assessment is to evaluate caused losses, possible losses and causing losses. Form this view, it includes three parts: pre-disaster assessment, mid-disaster assessment and sith-disaster assessment. Pre-disaster assessment and mid-disaster assessment belong to predictive assessment, while sith-disaster assessment is actual losses data. This system mainly aims at pre-disaster assessment and mid-disaster assessment, but because the influencing factors of flood disaster are various and complicated, and also have the dynamic and uncertain characteristics, it is impossible to evaluate damage losses caused by flood accurately. In a given region, on the basis of flood disaster losses mechanism, whether or not the flood losses are serious depends on magnitude and scale of flood itself. There are lots of indexes to weigh its magnitude and scale, but in out nation and aboard, many scholars accept the relationship between inundated water level and flood losses rate to predict flood losses. This is because the water level is higher and the losses are larger. So this relationship has fairly precision and reliability. In history, when a flood is recorded, it mainly referred to its flood water level, thus this system also

applies the relationship curve to pre-evaluate flood disaster losses.

The main content of relation curve of water level and losses rate is that according to information of history flood (such as inundated water level), social and economic information and other hydrologic information, flood disaster losses rate is calculated, namely: the ratio between inundation losses and original value, then we can establish relation curve of inundation water level and flood damage losses rate.

When user wants to compare different assets losses under the same water level, he can select the same water

level as he inputs flood water level, while inputs various assets as selects assets sorts. At the same time, he must inputs according assets amounts, after clicking “predication” button, and then it can get various asset loss values under the same water level. To compare asset losses better, this system also set up column diagram. When user clicks “displaying” button, a column figure will be shown in the interface. Thus, an intuitionist knowledge is achieved (Figure 2).

Figure 2 - System configuration of model:

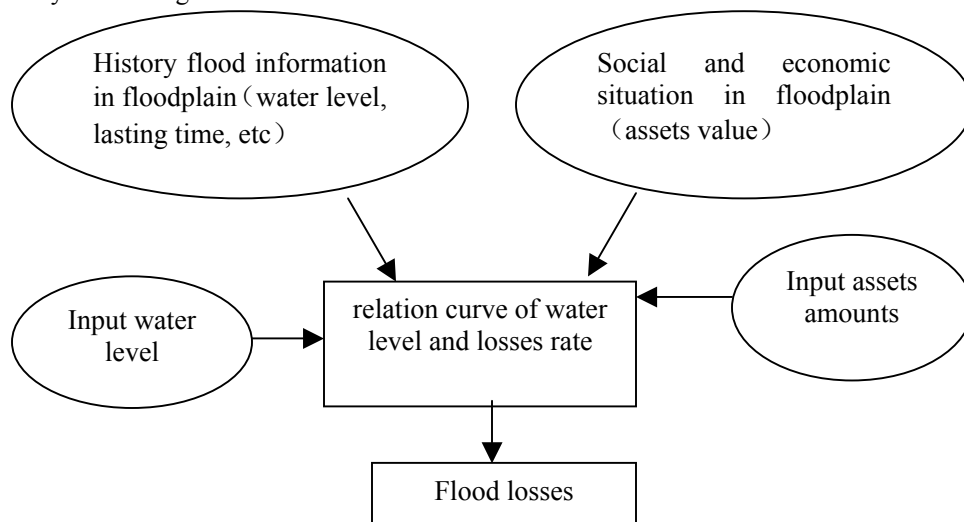


Figure 2. Model configuration of water level and losses rate

On the basis of inundation water level of various schemes and combing with social and economic information, flood damage assessment model predicts possible economic losses resulted from flood with various frequencies to assist to determine flood control standard and disaster reduction measures in a giver region. For cooperation with flood control planning of Hunhe River, direct economic losses in this paper include: industry, agriculture, transportation, business, postage, water engineering, family assets, etc. After inundation water level and corresponding loss rate are determined, we can multiple flood loss rate with assets value in direct economic losses, then to plus flood losses of various assets, flood damage direct economic losses in the whole studying area will be obtained.

2.2.3 Requiring and showing

Requiring and showing function can help flood control decision and management personnel to analyze flood disaster situation and query history flood, to inquire about needed information and related model parameter in pre-disaster, mid-disaster and sith-disaster, to predict and calculate flood water level and all asset loss values.

2.2.4 Achievement management

Achievement management mainly manages evaluation results of flood disaster losses, including the statistics and management of all kings of disaster information; report forms management and mimeograph; flood loss figures drawing of each item; editing, deleting, adding all sorts of evaluation achievement; etc.

3 Conclusion

Development of this system is in favor of flood control and disaster reduction decision in Hunhe River Basin. On the base of the quantitative relationships of characteristic (flood water level) of flood itself and social and economic losses, predicative flood loss evaluation caused by a flood is carried out. Meanwhile, for the convenience of real-time requiring, dynamic linkage is realized between data and model to effective dialogue between user and computer. So user directly participates in the whole operation process of model to reduce or avoid flood losses with more scientific and rational flood control and disaster reduction measures.

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