

Research and application of planning support system based on 3S techniques for post-disaster reconstruction after Wenchuan earthquake in China

(School of Architecture, Tsinghua University, Beijing 100084, P.R. China)

WENSHENG ZHOU*, FENG MAO, ZE LIU, QIANG LI, QIANG FU

Tel:86-10-62781980 Fax: 86-10-62792390 Email: zhou-ws@mail.tsinghua.edu.cn

Abstract:

Impacted by the 2008 Wenchuan earthquake in Sichuan, China (with the magnitude of 8.0 on the Richter scale), people's lives and property suffered huge losses; the earthquake caused the landslide, river course changing, roads twisting and city breaking down. Reconstruction under the scientific development view is the most urgent thing right now.

But there are many complex problems in the post-disaster reconstruction. For example, how to consider the geological conditions and the carrying capacity of resources conditions? How to keep away from the seismic fracture zone? How to make scientific and rational decisions as to locating the residential area, industrial complex and infrastructure? The GIS, RS and GPS techniques would provide powerful supporting for them. Various information of geological hazards would be extracted from imageries with remote sensing techniques, while GIS would be used to manage and analyze natural, social, economic and geologic information, and provide decisions supporting services for the whole planning process.

Firstly this paper discusses the technical route for applying 3S techniques in post-disaster reconstruction planning, and gives the general framework of the post-disaster reconstruction planning supporting system. Furthermore it mainly analyzes the database model and the function model of the post-disaster reconstruction planning supporting system. The databases include the multi-scale fundamental geographic information database (Digital Linear Graphic Model with scale of 1:1000000, 1:250000, 1:50000, and Digital Elevation Model of 1:50000), remote sensing database (satellite imageries of TM, ETM, SPOT and IKONOS), socio-economic database, geological disaster database and planning results database (planning texts, planning atlas, and related explanation for the plan and design). Geological disaster database include information of seismic fracture zone, landslide,

ground fissure, dangerous rock body and debris flow. The function model includes remote sensing imagery information extracting sub-system, disaster evaluation sub-system, planning analyzing sub-system and 3D analyzing sub-system. This paper also analyzes the key techniques to support the system, such as spatial data organization, evaluation model of earthquake disaster and extracting methods of disaster information .And at last gives the application cases of this system in the post-disaster reconstruction planning.

Application results show that, 3S technique plays an important role in the information extraction, disaster evaluation, location analysis of post-disaster reconstruction planning. It makes the post-disaster reconstruction planning more scientific and rational, and lays a solid foundation for the post-disaster reconstruction work.

Key words:

3S techniques, spatial information technology, Wenchuan Earthquake, relief works, planning support system

Reference:

- [1] Li D R. Remote Sensing Can Help Monitoring and Predicting Natural Disaster [J]. Science & Technology Review, 2007, 25(6):1. (in Chinese with English abstract)
- [2] Kumar A, Chingkhei R K, Dolendio T. Tsunami Damage Assessment: a Case Study in Car Nicobar Island, India [J]. International Journal of Remote Sensing.2007, 28(13-14):2937-2959.
- [3] Barnes C F, Fritz H, Yoo J. Hurricane Disaster Assessment with Image-Driven, Data Mining in High-Resolution Satellite Imagery [J]. IEEE Transactions on Geoscience and Remote Sensing, 2007, 45(5):1631-1640.
- [4] Duda K A, Abrams M. ASTER and USGS EROS Disaster Response: Emergency Imaging After Hurricane Katrina [J]. IEEE Transactions on Geoscience and Remote Sensing, 2005, 71(12):1346-1350.
- [5] Tralli D M, Blom R G, Zlotnicki V, et al. Satellite Remote Sensing of Earthquake, Volcano, Flood, Landslide and Coastal Inundation Hazards[J]. ISPRS Journal of Photogrammetry and Remote Sensing, 2005, 59(4):185-198.