The New Thinking of Slope Land Management

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ABSTRACT

Due to it is populous in Taiwan and environmentally, there are many mountains and slope land spreaded and less champaign in this island. Hence, the most important mission of the management is how to achieve the balance and harmony between the man-made development and the nature. Nevertheless, the slope land area is becoming the next and the best alternative for the land developing in addition to the champaign. People are moving their activities like living, agriculture, even industry into this new area. Therefore, the Slope Land Management becomes the most important task which needs to eliminate the illegal development through the low of development regulation set up. Moreover, to protect the safety of living and property, we shall not control but manage the nature with the concept of conservation not pillage.

Supervising and banning the illegal activities, is to make sure the development of slope land is legal. And through coordinating the conservation actions and management concept to get the slope land under protection completely. In the speedy era, it will not solve the problems efficiently with traditional management. It should be improved by the new management methods containing the geographic information and science technology to make the performance of slope land management efficiently and successful. This should be the only way to assure the slope land developing toward the safety and mutual-benefit between human being and the nature.

KEY WORDS: Slope Land Management; Geographic Information System

1. Introduction

The total area of Taiwan are 3,600,687 hectares, the mountain area are 2,638,136 hectares (the high mountain forest are 1,657,362 hectares, common slope lands are 980,774 hectares), it is 73.27% of all land; plain are 962,551 hectares, it is 26.73% of all land.

Figure 1 Satellite Image of Taiwan

The prosperity of economical, the growth of population, cause the usage of plain is tight. Then the mountainsides become more important in people living, economical activity, and the development of agriculture, forestry, fishery, and pasturage. But it includes many unfavourable conditions of the slope lands in Taiwan. For example, the steep slope, fractural land, short and steep river, and locates in the earthquake area, the making mountain activities are still active, the average rainfall of the year up to 2,510 millimetres and almost in the period of month 5-9, soil easy to wash away, then cause collapse, debris flow and big flood, make dangerous to human life and property. After the 921 earthquakes, and Hsiang-shen, Tao-chi typhoon, many disaster areas need reconstruction. So having a good water and soil conservation, make the slope lands have reasonable usage and running forever, reduce the damage happen are the important issue of every resident in Taiwan.

Figure 2 the epicentre of the 921 earthquakes (Airborne image photo at 3 years after the 921 earthquakes)

2. Slope Land Management in Taiwan

The Soil and Water Conservation Bureau (SWCB) is main management and investigations government organization in Taiwan. The bureau has eight sections and offices in charge of planning and programming, slope land conservation, watershed protection, mudslide monitoring and management, secretarial affairs, personnel, accounting and ethics, plus six engineering institutes. The bureau's missions of slope land management include:

a). Post-disaster land rehabilitation in regions affected by the 921 earthquakes and reconstruction of farming communities.

b). Mountain ecosystem conservation and disaster prevention, and overall planning and management of river confluence areas.

c). Formulation of a slope land disaster prevention system, monitoring and prevention of landslide disasters, and implementation of contingency measures.

d). Slope land management and investigations into illegal use of slope land.

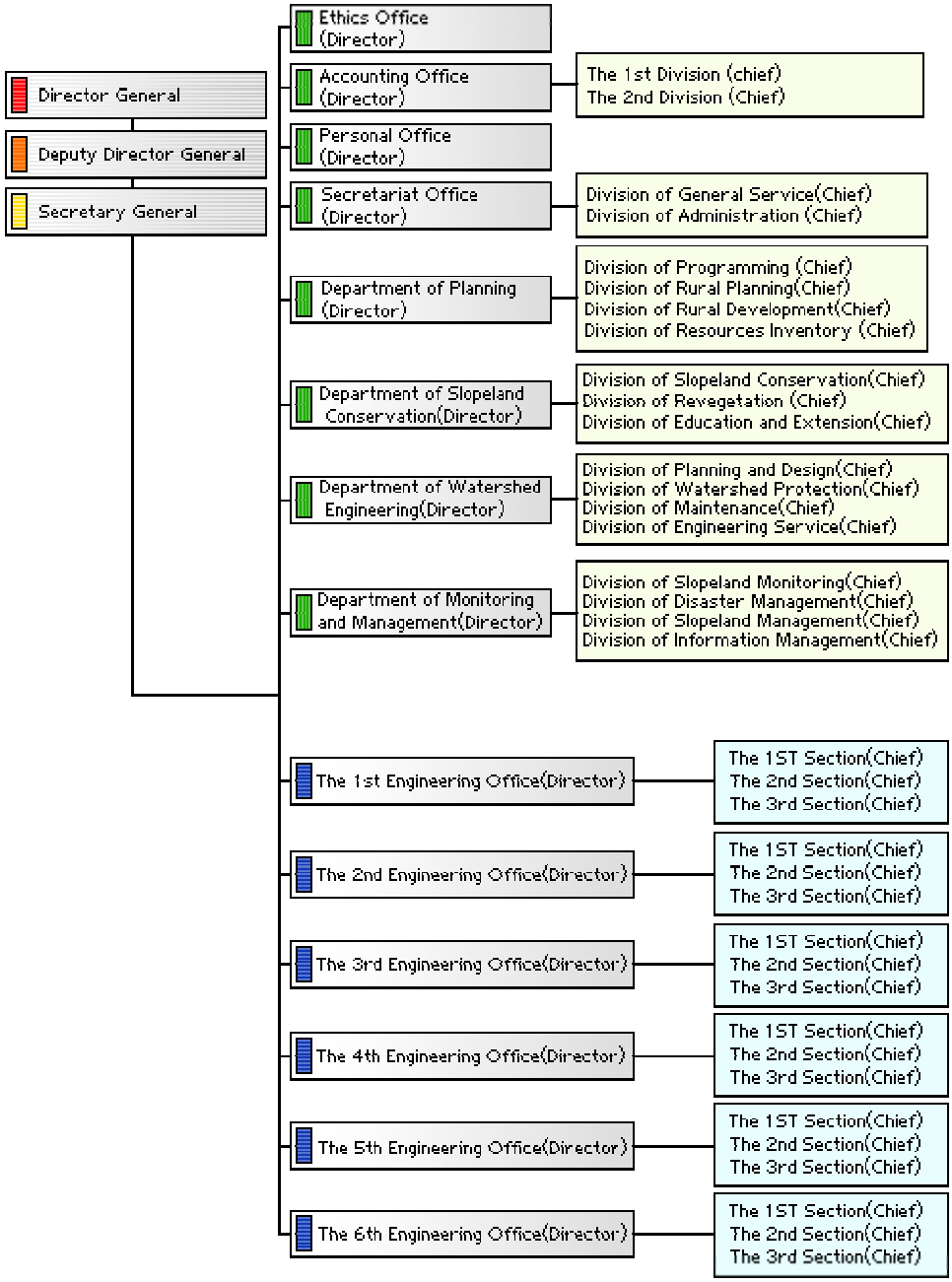

Figure 3 the organization of Soil and Water Conservation Bureau

2.1 Slope Land Development

The SWCB empowered the soil and water conservation engineer to project design and construction inspection, and inspect the development plans. The soil and water conservation engineer must keep their slope land safe. Their responsibilities are to collect all aspects of field data collection, project design, and construction inspection associated with watershed restoration project design. The SWCB divided slope land development into seven types. As following:

a). standard development in slope land
b). digging a well or collecting sandstone
c). building a road but exclude highway
d). building a highway
e). building a railroad
f). a project of development in slope land
g). a simple building in slope land

All development plans comply with all Soil and Water Conservation rules. The SWCB inspects the development plans. The exam worked well, as shown in Figure 4.

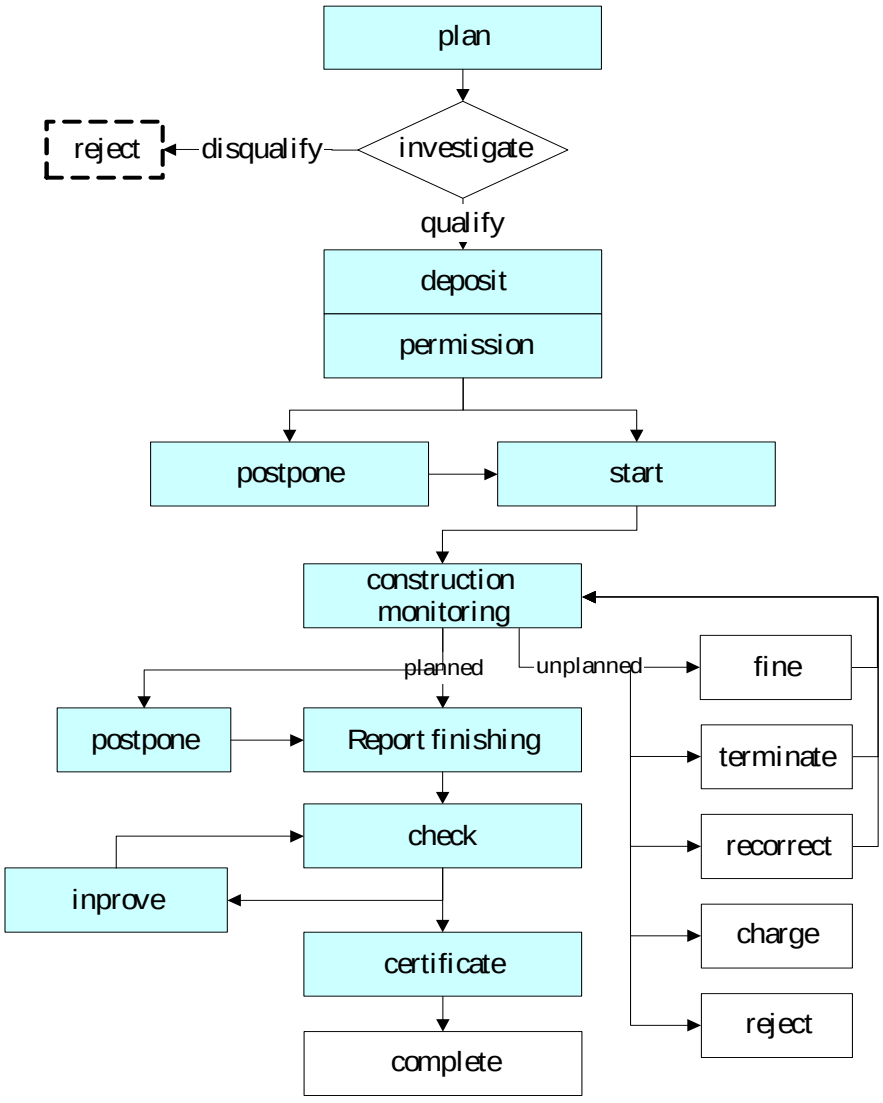

Figure 4 the inspection flow chart

2.2 Applications of Geographic Information Systems

The integrated system which includes Geographic Information Systems, Management Information System, and Debris Flow Disaster Response System

employed ArcIMS, ArcSDE, and SQL Sever to provide a model for government organizations to manage slope lands.

Geographic Information Systems: Provides the functions to inquire and download maps, positioning, etc

Management Information System: Controls the mountainside precaution projects, and follows the schedule, quality and fund management of each project.

Debris Flow Disaster Response System: Assists the related organizations in following the debris.

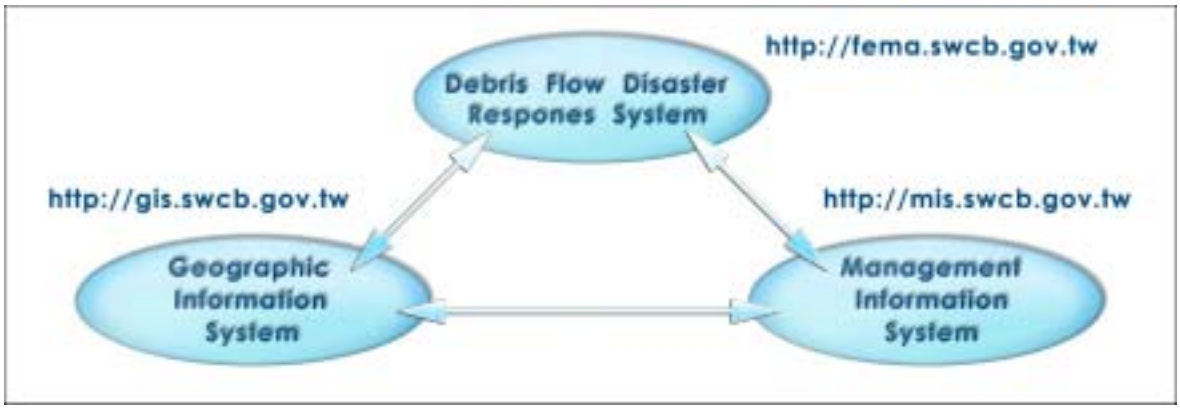

Figure 5 Integrated Systems

Figure 6 Integrated System Frameworks

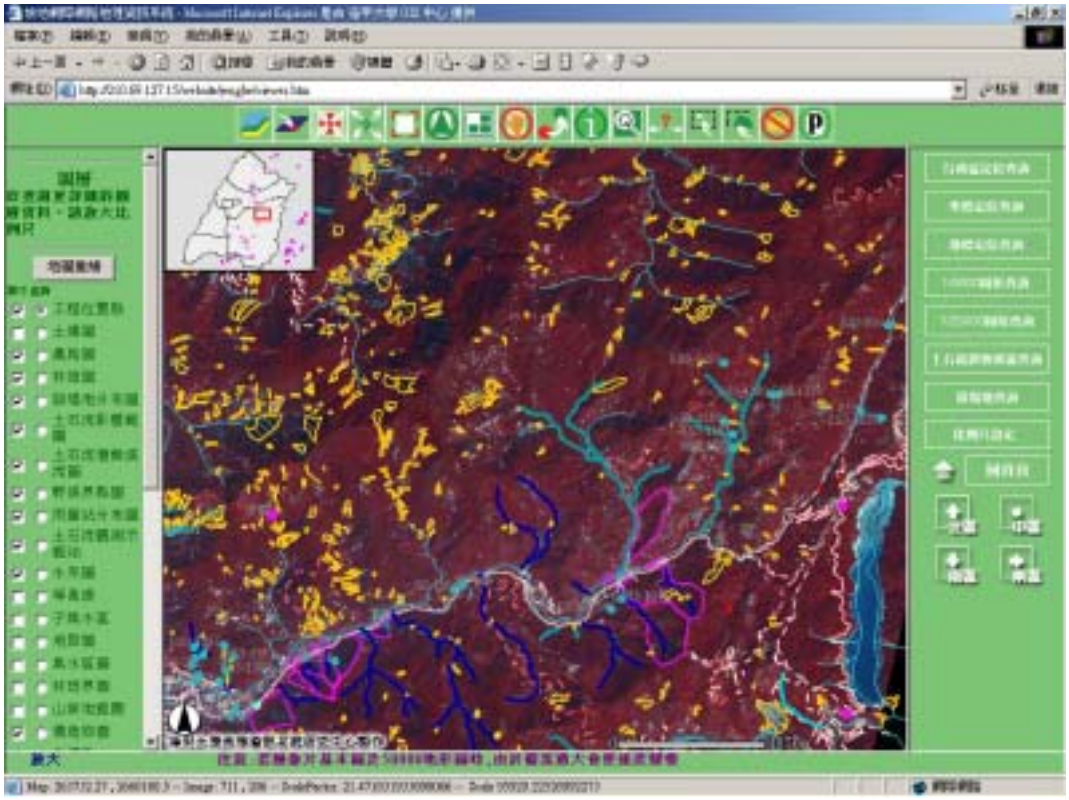

Figure 7 Tumble Monitoring (using Spot satellite image to find out land cover changes)

Figure 8 Construction stage management (illustrated different colour to get spatial distribution information)

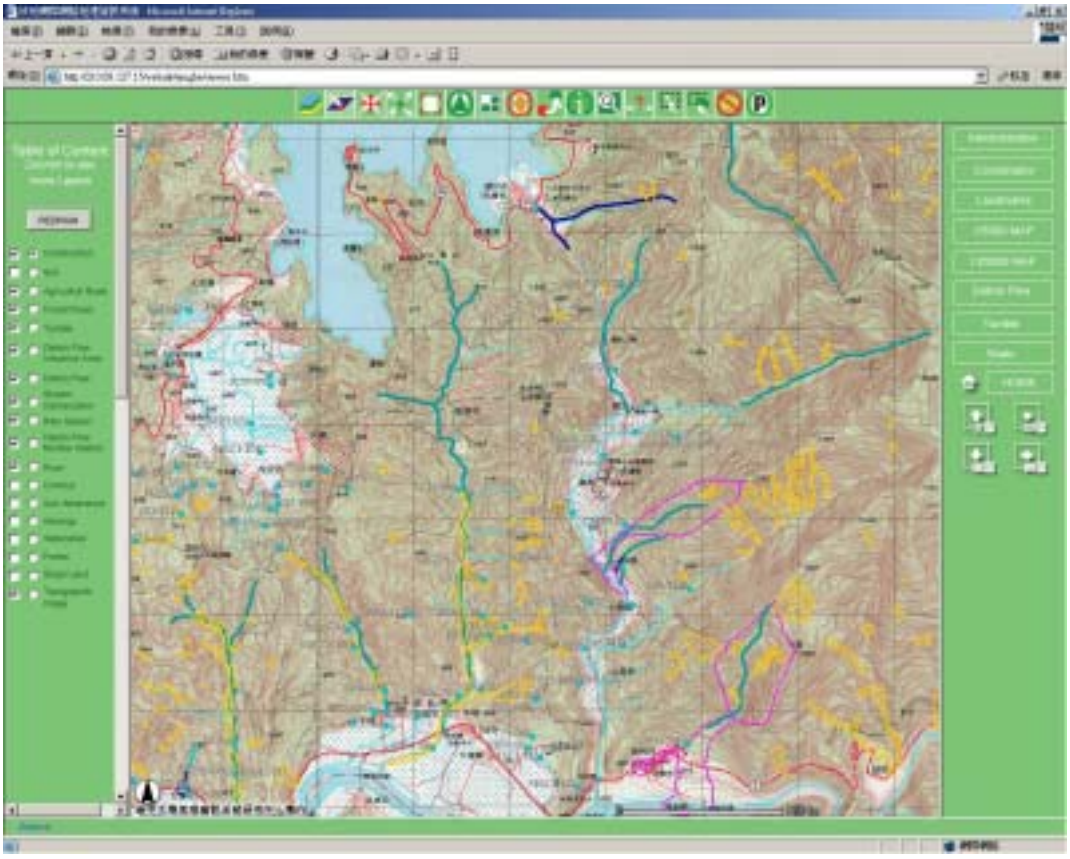

Figure 9 Topographic Map (to query debris flow, influenced area and dangerous village in all sub-watersheds)

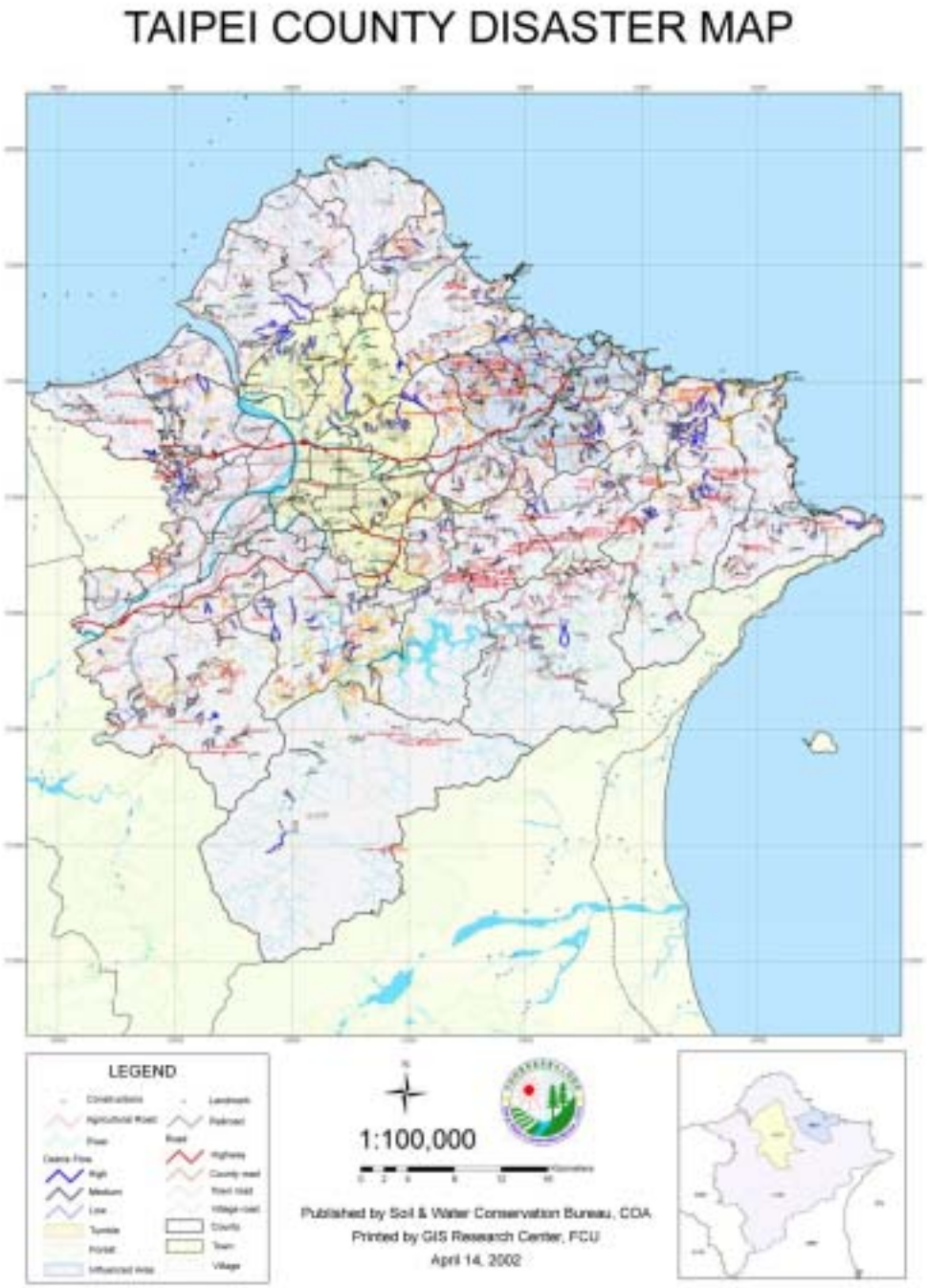

Figure 10 Disaster Map Output

2.3 Checking Equipment and Soil and Water Conservation Management System

Some illegal activities in slope land can not be restored. Therefore, preventing illegal activities and supervising development are more important for Slope Land Management. Slope Land Management is composed of supervising development and preventing illegal activities in Taiwan.

In order to make sure the management of slope land work well. The GIS Research Center of Feng Chia University develops Soil and Water Conservation Management System. And it is being used to monitor by government officers.

It also has data system, monitoring, statistics analyzing, and search function. PDA has the same functions as well. Working with GPS, digital cameras, and laser rangefinder to position, record the real situation and measure distance and area.

Through GPS, PDA, digital cameras, and laser rangefinder, etc enhance slope land management and ensure the safety.

Figure 11 Checking Equipment and monitoring

Figure 12 Mobilized Surveys Solution (Using GPS and PDA devices to take down disaster position and construction quality at on-site survey)

3. Conclusion

Although unfavourable slope land is fragile, the investigation result says most unfortunate disaster happened because of illegal activities. Therefore, it is important to upgrade the information equipment for slope management. It is also important to teach people how to protect the slope land in order to reduce the disaster.