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The Development Geo-Information Technology on Flood and Landslide Preventing and Solving for the Local Government at Uttaradit Province, Thailand

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Abstract: Landslides due to heavy rainfall are remarkably increased during the last decade. Past record shows that Thailand had lost in life and natural resources. This research aimed to the development on flood and landslide preventing and solving for the local government at Uttaradit province, Thailand by applying geo-information technology. The data were analyzed by using computer Geographic Information System (GIS) program Quantum GIS.

Key words: Geo-Information Technology (GIT), flood, landslide, preventing, solving, local government

INTRODUCTION

A landslide or landslip is a geological phenomenon which includes a wide range of ground movement such as rock falls, deep failure of slopes and shallow debris flows which can occur in offshore, coastal and onshore environments. Although, the action of gravity is the primary driving force for a landslide to occur, there are other contributing factors affecting the original slope stability. Typically, pre-conditional factors build up specific sub-surface conditions that make the area/slope prone to failure whereas the actual landslide often requires a trigger before being released (Kuriakose *et al*., 2008). Landslides due to heavy rainfall are remarkably increased during the last decade. Past record shows that Thailand had lost in average 15 lives and 105 million baht annually (Mairaing and Thaiyuenwong, 2010).

In recent years, remote sensing and Geographic Information System (GIS) technologies have significantly promoted the ability to map earthquake-induced landslides (Wang *et al*., 2007). With the benefit of aerial photographs, multi-source remote sensing imagery and field investigations, slope failures and catastrophic landslides induced by earthquakes have been extensively mapped and analyzed in many countries. Some of such landslides can impact property, developed areas and infrastructures, leading to economic losses and sometimes fatalities. Understanding where these types of landslides are most likely to occur is crucial in reducing property damage and casualty in future earthquakes (Xu and Xu, 2012).

Local government practices in Thailand have become more participatory or governance oriented since the promulgation of the Constitution of 1997 and the Decentralization Plan and Process Act of 1999. Several local governments have applied modern concepts of New Public Management and participatory approaches in performing their tasks (Jansamood, 2012)

This research therefore, emphasized on the development of Geographic Information System (GIS) on flood and landslide preventing and solving for the local government at Uttaradit Province, Thailand.

MATERIALS AND METHODS

Study and survey data for developing knowledge, awareness and practical solving flood and landslide prevention by applying geo-information technology. Design and prepared by the floods and landslides associated with database support agencies to assess the risk of flooding and landslides in advance. Include:

- The topographic map overlay Digital Elevation Model (DEM) from the Royal Thai Survey Department (RTSD) scale 1:50,000
- Data of Landsat ETM+ from The Global Land Cover Facility (GLCF)
- Rainfall data (mm/day)
- Land use data
- Geological data

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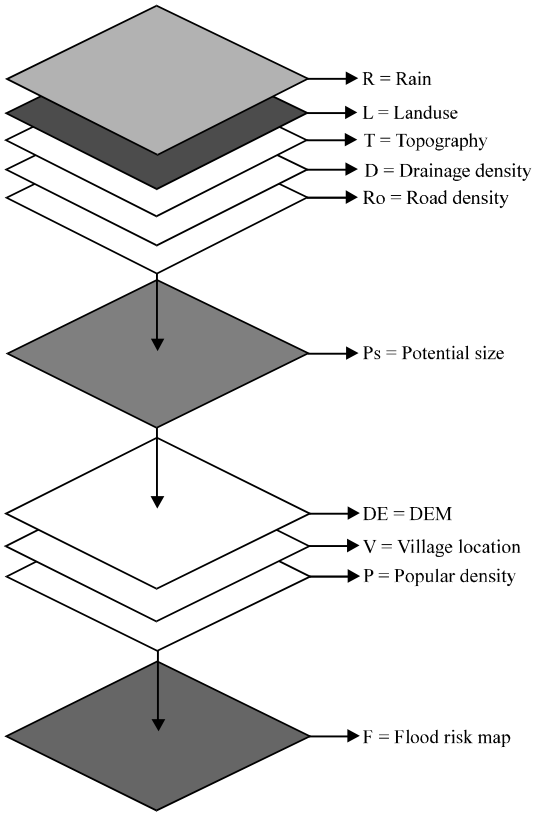

Fig. 1: Flooding Model

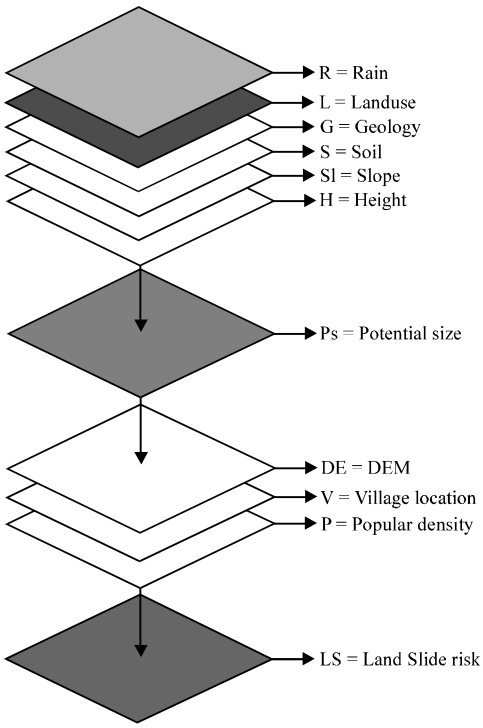

Fig. 2: Landslide Model

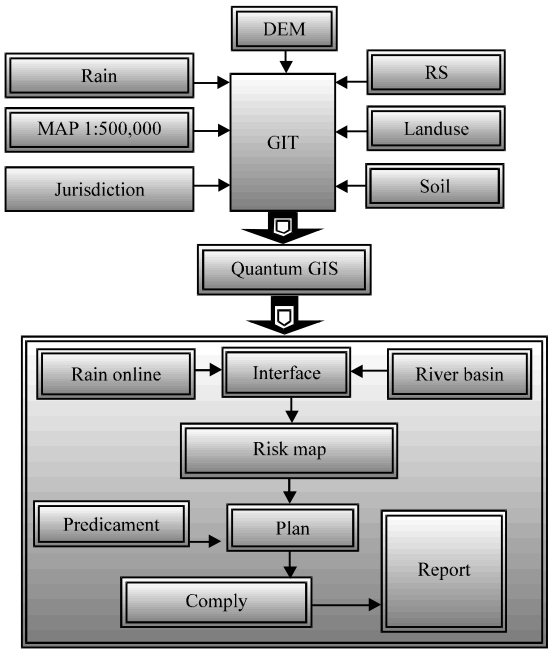

Fig. 3: Diagram of the program

- Agronomy data
- Traffic data
- Hydrology data
- Demographic data
- Registration data

Modeling flooding and landslide as follow: The equation of flooding model show that (Fig. 1):

$$PS = f(R, L, T, D, Ro) = aR+bL+cT+dD+eRo$$

$$F = f(PS) = aPS+bDE+cV+dP$$

The equation of landslide model show that (Fig. 2):

$$PS = f(R, L, G, S, Sl, H) = aR+bG+cL+dS+eSl+fH$$

$$LS = f(PS) = aPS+bDE+cV+dP$$

Create the application of Geographic Information System (GIS) on solving flood and landslide prevention which the diagram of the program is as shown in Fig. 3. Trial application of Geographic Information System (GIS) on solving flood and landslide prevention with local government officers to result in a further development.

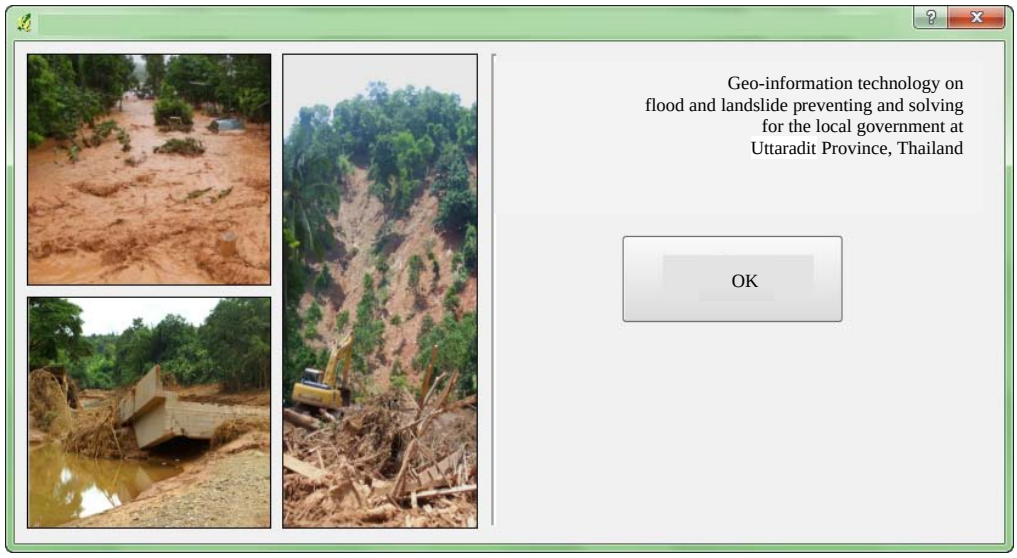

Fig. 4: Front page of program

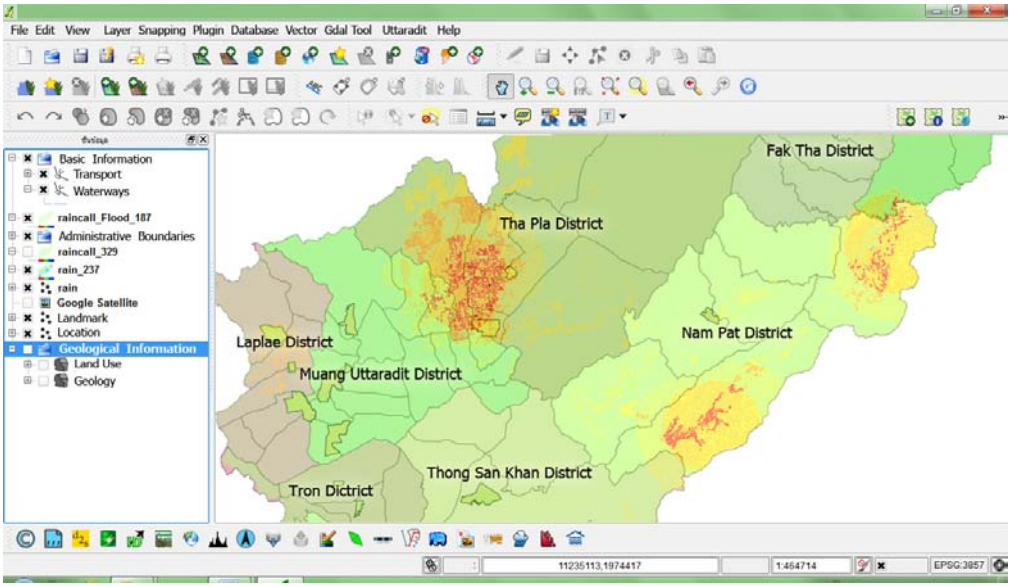

Fig. 5: Area for analyze

RESULTS AND DISCUSSION

The program of geo-information technology on flood and landslide preventing and solving showed analyzed the data that Fig. 4-5.

CONCLUSION

The developed geo-information technology system had 3 components: the duplication of floodings and landslides model, the analysis of the potential size for floodings and landslides and the display map of the risk area of floodings and landslides in the watershed.

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REFERENCES

Jansamood, C., 2012. The roles and responsibilities in natural resources and environmental management of local government in Thailand. Social Sci., 7: 16-19.

Kuriakose, S.L., G. Sankar and C. Muraleedharan, 2008. History of landslide susceptibility and a chronology of landslide prone areas in the Western Ghats of Kerala, India. Environ. Geol., 57: 1553-1568.

Mairaing, W. and S. Thaiyuenwong, 2010. Dynamic landslide warning from rainfall and soil suction measurement. Proceedings of the International Conference on Slope 2010: Geotechnique and Geosynthetics for Slopes, Chiangmai, Thailand, July, 27-30, 2010, Department of Highways, Thailand.

Wang, H.B., K., Sassa and W.Y. Xu, 2007. Analysis of a spatial distribution of landslides triggered by the 2004 chuetsu earthquakes of niigata prefecture, Japan. Natl. Hazard, 41: 43-60.

Xu, C. and X. Xu, 2012. Controlling parameter analyses and hazard mapping for earthquake-triggered landslides: An example from a square region in Beichuan County, Sichuan Province, China. Arabian J. Geosci., (In Press). 10.1007/s12517-012-0646-y.