

# 以雨量為基礎之土砂災害警戒系統成效評估— 以台灣及日本為例

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**摘要** 建立警戒系統，適時疏散民眾，已被公認是防災策略中，重要且有效的方式。國內外已有大量的文獻研究如何建立以雨量為指標的土砂災害警戒模式，但對於完整的警戒系統（包含警戒模式及發布機制）實際應用時所面臨的問題及其成效評估方式，卻少有研究探討。本文以台灣及日本建立多年的土砂災害警戒系統為例，比較二者在警戒模式與發布機制之異同，並提出涵蓋率、命中率、誤報率及剩餘疏散時間等警戒發布成效之評估指標；此外，藉由歷年統計數據及災害實例指出現行模式對於災害可能發生之明確地點、類型及規模的掌握上尚有不足，同時提出未來可行的改進策略及研究方向。

**關鍵詞：**預警系統、土石流、崩塌、警戒成效評估、疏散。

## Evaluation of Rainfall-Based Sediment Disaster Warning Systems: Case Studies in Taiwan and Japan

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**ABSTRACT** Establishing warning systems and evacuating inhabitants are recognized as important approaches for disaster risk reduction. While the rainfall-based warning model of landslide or debris flow disasters has been extensively investigated, the problems of implementing the rainfall-based warning model during typhoons or heavy rainfall have received less attention. This study evaluated the warning systems for debris flows and slope failures in Taiwan and Japan. We discuss the characteristics of the warning models and warning issuing systems in Japan and Taiwan, and also suggest evaluation indexes of warning effectiveness: the warning hit rate, false alert rate, warning cover rate, and remaining time for evacuation. In addition, this study focuses on the lack of attention to current rainfall-based warning models during actual disaster cases and several years of statistical data. Finally, this research recommends future disaster prevention strategies and resolution.

**Key Words :** Rainfall-base warning system, debris flow, slope failure, evaluation, evacuation.

### 一、前言

面對土砂災害的威脅，建立警戒系統，即時發布土砂災害警戒，疏散土砂災害潛勢區內的民眾，是降低人員傷亡最直接的方法。國內外已有許多研究嘗試使用不同類型的指標來建立具體可行的土砂災害警戒

系統。由於雨量係造成土砂災害的重要誘因，且實務上，雨量資料係較易即時取得的現地監測資訊，故以雨量為警戒指標的土砂災害警戒模式是各類型警戒系統中，最常使用的模式。由於自然環境的影響，日本及台灣每年颱風豪雨期間均飽受土砂災害的威脅，故早已建立以雨量為指標的土砂災害警戒系統，且有多