

GeoS4S Module Disaster Risk Management

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Abstract

Disaster Risk Management (DRM) is used to refer to Disaster Risk Reduction (DRR) and Disaster Management (DM). The basic knowledge before DRM is understanding in disaster cycle; pre-disaster, during-disaster, and post-disaster. It is an arrangements for and practices of reducing hazard risks and for preparing for responding to and recovering from disasters when they occur. It is also the events that Geo-information could plays a big role in disaster risk management. The teaching and learning system of this module are project-based learning (PBL). Student will be facilitated learning by supporting, guiding, and monitoring the learning process.

Key Words: Disaster Risk Management (DRM), Disaster Risk Reduction (DRR), Disaster Management (DM), Disaster Management Cycle, Geo-information Technologies

1. Introduction

As disaster is the events Geo-information plays a big role in disaster management cycle. Mitigation of disasters can be successful only when detailed knowledge is obtained about the expected frequency, character, and magnitude of hazardous events in an area. Geo-information therefore can help to obtain those spatial issues. There are three main advantages of Geo-information for disaster management. The first one is right information. Geo-information provides a data base from which the evidence left behind by disasters that have occurred before can be interpreted, and combined with other information to arrive at hazard maps, indicating which areas are potentially dangerous. The next one is right place. Geo-information data allow us to map the variabilities of terrain properties. And the last one is right time. As the satellites can detect the early stages of these events. Images are available at regular short time intervals, and can be used for the prediction of both rapid and slow disasters.

1.1 Module Description

According to the Geo-Information technology have now been used extensively at global. These technologies can be used for multi-disciplinary applications, monitoring, surveillance, management and mitigation of the problems occurred in the world. They are for example, forest, agriculture, land use planning, environmental management, health situation, and disaster events. Disaster problems are now rising far more frequently and severely, both at global, nation, and local levels. It became common interested issues for the academic research. This module therefore focuses on an integration of Geo-Information technology to provide the information for disaster risk management (DRM). Geo-Information is a technology for processing, storing, analyzing and visualization geospatial data have advanced greatly in the last years toward building national and global spatial data infrastructures. These new developments can contribute to improved prediction and monitoring of hazards, risk reduction, and emergency response. Disaster risk management cycle; pre-disaster, response, and post-disaster, is also the important issue for understanding especially integration of spatial data based on Geo-information technology for planning. This module will also examine specifically the role of spatial method play in DRM. The severe disaster events within the module are selected as the case study. They include flood, landslide, haze pollution and forest fire, and drought. Disaster risk management of these disasters will be provided for teaching and learning.

1.2 Learning

- Understand concepts of geo-information technology and disaster risk management.
- Explain spatial data based on geo-information technology in disaster risk management.
- Integrate geo-information technology for disaster risk management.
- Manage disaster risk event.

2. Module Structure

2.1 Module Overview

This module consists of 15 lessons, plus required and optional reading assignments, practice exercises, hands-on interactive and individual assignments, and self-assessment. The overall student effort is estimated at 150 to 170 hours. There are 5 exercises for lesson 1-8 which students can use to make sure that they have understood the key concepts in this module. Four assignments are designed for lesson 9-12 of this module. There are 3 laboratories set for lesson 4, 6 and 8 of this module. One mini-project is set for lesson 13-14 of this module. The module is intended to provide credit equivalent to 6 ECTS.

2.2 Summary of Lesson Content

This section briefly presents the content and goals of each lesson.

- *Lesson 1: Introduction to disaster risk management* - This lesson identify and describe the types of disaster and describe basic principles, concepts and process of DRM.
- *Lesson 2: Spatial data for disaster risk management* - This lesson explain the spatial data types and describe sources of spatial data.
- *Lesson 3: Geo-information technology for disaster risk management* - This lesson state the advantages of using geo-information technology in disaster risk management and explain geo-information technology utilize within disaster risk management cycle.
- *Lesson 4: Pre-disaster: Disaster risk map* – In this lesson, students will understand a concept to create disaster risk map and also explain data and method to create disaster risk map by using geo-information technology.
- *Lesson 5: Pre-disaster: Early warning system* - In this lesson, students will understand a procedures to early warning disaster risk design early warning ring system.
- *Lesson 6: Pre-disaster: Disaster Risk model* - In this lesson, students will understand a procedures for disaster risk model explain data and method to create the model for various disaster risks.
- *Lesson 7: During disaster: Emergency Operation* - This lesson explains typical disaster response activities that can be used geo-information technology and explain data and method to operate emergency event.
- *Lesson 8: Post-disaster: Recovery* - This lesson explain activities of disaster recovery that can be used geo-information technology and explain data and method to recovery after disaster event.
- *Lesson 9: Case study: Flood risk management* - In this lesson, students will understand the basic concept of flood and can manage flood risk by using geo-information technology.
- *Lesson 10: Case study: Landslide risk management*- In this lesson, students will understand the basic concept of landslide and can manage landslide risk by using geo-information technology.
- *Lesson 11: Case study: Haze pollution and forest fire risk management* - In this lesson, students will understand the basic concept of haze pollution and forest fire and also manage haze pollution and forest fire risk by using geo-information technology.
- *Lesson 12: Case study: Drought risk management* - In this lesson, students will understand the basic concept of drought and can manage drought risk by using geo-information technology.
- *Lesson 13-14: Mini project: select disaster event on student's region and environment* - In this lesson, students will able to identify disaster event on student's country, plan to solve the disaster problem by list what they need to know, and how and where to access data, how to manage the spatial data from the different sources, and how to analyze those data. And also student can integrate geo-information technology for disaster risk management.
- *Lesson 15: Conclusion* - This concluding lesson analyze/syntheses disaster problem and plan for disaster risk management by integration of geo-information technology.

3. Hands-on Sessions

The objectives of this module are to implement the hands-on learning activity on matter case study. Many of these activities are part of the module evaluation scheme.

- Flood risk area (Lesson 4)
- Drought risk model (Lesson 6)
- Forest Fire Damage Map (Lesson 8)
- Flood risk management by using Geo-information technology (Lesson 9)

- Landslide risk management by using Geo-information technology (Lesson 10)
- Haze risk management by using Geo-information technology (Lesson 11)
- Drought risk management by using Geo-information technology (Lesson 12)

This module requires the basic concepts and skills in remote sensing and GIS.

4. Teaching and Learning System

The module is divided into five main parts, which use rather different learning methods.

Part 1: (lessons 1-3) introduces definitions, types of disaster, basic principle of DRM, spatial data types, sources of data types, advantages of geo-information technology in DRM, and how geo-information technology utilise within DRM cycle. Students will read 10 short papers discussing the basic principles of DRM and practice of DRM. This sub-module also offers 3 self-assessment to allow students to check their understanding.

Part 2: (lessons 4-8) focuses on disaster risk management cycle; *pre-disaster*; disaster risk map, early warning system, and disaster risk model, *during disaster*; emergency operation, and post-disaster; recovery. Learning activities will involve practice of geo-information technology with each DRM cycle and case study. This sub-module also offers 2 self-assessment to allow students to check their understanding and 3 laboratory for evaluation.

Part 3: (lessons 9-12) focuses on geo-information technology for case study; flood, landslide, haze pollution and forest fire, and drought. Students will understand basic concept of each disaster and can manage each case study by using geo-information technology. They will complete four hands-on assignments.

Part 4: (lessons 13-14) assign mini-project relates to disaster event on student's region and environment. Students will complete their mini-project using some method of geo-information technology.

Part 5: (lessons 15) presents an analysis/synthesis disaster problem and plan for disaster risk management by integration of geo-information technology. Students will be required to analyze, evaluate and critique the case study in interactive.

5. Evaluation System

Performance evaluation for this module involves two components:

- Knowledge: evaluate by exercise (30%)
 - 3 Laboratory (lesson 4, 6, and 8) and extra readings (all lesson) (30%)
- Skill and responsibility: evaluation by assignments and mini-project (70%)
 - 5 Exercises (lesson 1, 2, 3, 6, 7&8) (20%)
 - 4 assignments (lesson 9, 10, 11 and 12) (20%)
 - 1 mini-project (lesson 13 and 14) (30%)

Both knowledge and skill evaluations are as follows:

Exercises list:

Exercise 1: Disaster risk management concept

Exercise 2: Spatial data for disaster risk management

Exercise 3: Disaster risk management by using Geo-information technology

Exercise 4: Disaster preparedness and mitigation by using Geo-information technology

Exercise 5: Disaster response and recovery by using Geo-information technology

Laboratory list:

Laboratory 1: Flood risk area

Laboratory 2: Drought risk model

Laboratory 3: Forest Fire Damage Map

Assignment list (case study):

- Assignment 1: Flood risk management by using Geo-information technology
- Assignment 2: Landslide risk management by using Geo-information technology
- Assignment 3: Haze risk management by using Geo-information technology
- Assignment 4: Drought risk management by using Geo-information technology
- Mini-project: Geo-information for Disaster Risk Management

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Bibliography

- Ciurean, R. L., Schroter, D. and Glade, T. 2013, *Conceptual Frameworks of Vulnerability Assessments for Natural Disasters Reduction*, from <http://www.intechopen.com/books/approaches-to-disaster-management-examining-the-implications-of-hazards-emergencies-and-disasters/conceptual-frameworks-of-vulnerability-assessments-for-natural-disasters-reduction>
- Tomaszewski, B. 2006, *Geographic Information Systems (GIS) for Disaster Management*. New York: USA.
- Twigg, J. and Humanitarian Practice Network, 2004, Disaster Risk Reduction: Mitigation and Preparedness in Development and Emergency Planning". *Good Practice Review*. Humanitarian Practice Network, London.
- UNISDR, 2014, *Progress and Challenges in Disaster Risk Reduction: A contribution towards the development of policy indicators for the Post-2015 Framework on Disaster Risk Reduction*. Geneva, Switzerland. The United Nations Office for Disaster Risk Reduction (UNISDR).