

Web Map Application for Flood Management in Thailand

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ABSTRACT

Two years ago Thailand was hit by one of the most devastating natural disasters, the 2011 flood. The severe flood covered the majority part of Northern and Central Thailand, affecting agricultural sector, industry, family homes and inevitably the economy of the country. With lesson learned from this major flood, the Thai government has developed an integrated water and flood management plan, in order to manage the country's flood prone area as a whole. The plan holistically deals with water and flood management from upstream to downstream, taken into account the characteristics of the country's terrain. For upstream, the plan emphasizes on reforestation to help absorbing the water and delaying the flood flow. In the lowlands, the plan focuses on improving irrigation and designing new ways of agricultural practice to suit local conditions of different area. For the lowest downstream part of the basin which covers the main area of Thai economy including Bangkok, the plan emphasizes on expanding and increasing the flood flow channels in order to reduce water level during the flood season and improve drainage to the Gulf of Thailand.

Geo-Informatics and Space Technology Development Agency: GISTDA is the main agency assigned by the Thai government to utilize satellite data and geospatial technology for various modules of the integrated plan. In addition, GISTDA has been assigned to provide geospatial information for government agencies related to water and flood management. This work aims to demonstrate how satellite data especially from Thaichote (THEOS) and geospatial technology can be utilized for each module of flood management, and to describe web map application development for information dissemination.

To integrate all the flood related data and share with all relevant government agencies, the new web map applications for flood management had been developed. GISTDA processed and integrated satellite data and geospatial information with ArcGIS, and analyzed into information useful for flood management planning. Various government agencies can access such information from GISTDA's ArcGIS Server through the internet with computers, tablets and smart phones. This web map application for flood management can ensure that the information can be accessed in a timely manner.

Keywords: Flood management, Disaster, Thaichote, Geospatial information

INTRODUCTION

Large floods in Thailand are usually due to influence of tropical storms. In 2011, Nock-Ten is the name of the big storm which caused flooding and major damage covering most areas of the country between July and December 2011. It has affected a total of 65 provinces, 684 districts, 4,920 sub-districts, 43,636 villages, 4,086,138 households and 13,595,192 people have suffered, with a flooded area of approximately 42,400 million square meters, or about 26.5 million hectares and the height of the water at the average 1.5 meters equals volume of flood at approximately 63,600 million cubic meters. In particular, the areas of economic importance in Bangkok and its vicinity were severely damaged from October to December 2011. Satellite data show a flooded area of approximately 4,355 million square meters, or about 2.7 million hectares, with the average 1.5 meters of flood level near Bangkok area, yielding flood volume of 6,533.25 million cubic meters.

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plan holistically deals with water and flood management from upstream to downstream, taken into account the characteristics of the country's terrain. For upstream, the plan emphasizes on reforestation to help absorbing the water and delaying the flood flow. In the lowlands, the plan focuses on improving irrigation and designing new ways of agricultural practice to suit local conditions of different area. For the lowest downstream part of the basin which covers the main area of Thai economy including Bangkok, the plan emphasizes on expanding and increasing the flood flow channels in order to reduce water level during the flood season and improve drainage to the Gulf of Thailand.

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OBJECTIVE

1. To apply and evaluate geo-informatics dataset to manage flood prone area
2. To develop the web map application for information dissemination

MATERIALS AND METHODS / EXPERIMENTAL

Study area and available data

The study area covered the majority part of Northern and Central Thailand, the country's flood prone area.

The digitally based inventory of important input data themes in the study area are pre-processed and compiled from the secondary data (scale of 1:25,000), field investigation and interpretation of SAR imagery. The important input data themes that are pre-processed and inventoried in this research are concluded in Table 1.

Table 1: Overview of important input data themes that are pre-processed and inventoried in this research

DATA	Acquired date	Format	Source
Flood yearly	1996-2010	Shapefile	GISTDA
Flood monthly	2011	Shapefile	GISTDA
Drainage	2010	Shapefile	GISTDA
Land use	2010	Shapefile	GISTDA
Forest	2011	Shapefile	GISTDA/MNRE
Administrative Boundary	2008	Shapefile	DOPA
Irrigation area		Shapefile	RID
Floodgate position	2011	Shapefile	NWOC
Pump position	2011	Shapefile	NWOC
CCTV position	2011	Shapefile	NWOC

Remark: GISTDA = Geo-Informatics and Space Technology Development Agency
 MNRE = Ministry of Natural Resources and Environment
 DOPA = Department of Provincial Administration
 RID = Royal Irrigation Department
 NWOC = Office of the National Water and Flood Management Policy

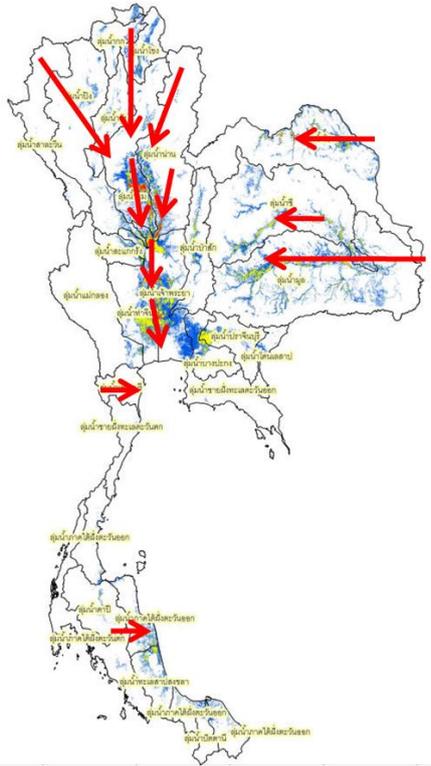


Figure 1. Location map of the Study Area including direction of the water flow

Methodology

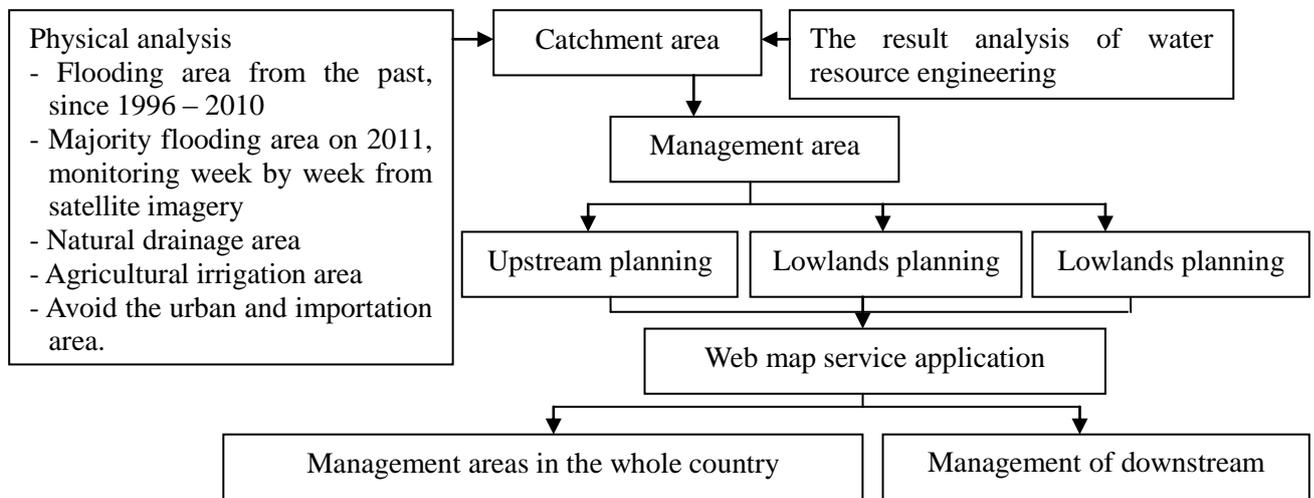


Figure 2. Increases number of household and household with AC (current and prediction)

According to the water and flood management from upstream to downstream, the plan for upstream emphasizes on reforestation and planting Vetiver grass in high land with sloped landscape to help absorbing the water and delaying the flood flow. Ministry of Natural Resources and Environment has been assigned the responsibility of planning and surveying for reforestation and Vetiver grass planting. Database of these areas has been prepared to track the progress and the areas have been monitored by Earth observation satellite regularly.

In the lowlands, the plan focuses on the improvement and enhancement of the management of water about 5,000 million cubic meters in the irrigation zone. These include adding floodgates and pumps, expanding canal routes in the basin and designing new ways of agricultural practice to suit

local conditions of different areas. This information were put into GIS format, overlaid and analyzed, taken into consideration from repeatedly flooded area, drainage, agricultural irrigation and attempting to avoid the urban or areas of economic importance.

For the lowest downstream part of the basin which covers the main area of Thai economy including Bangkok, the plan emphasized on expanding and increasing the flood flow channels in order to reduce water level during the flood season and improve drainage to the Gulf of Thailand.

The results of each part have been imported into ARC Server to manage and prepare the geo spatial database as a web map service (WMS). Web application for water management and decision support has been designed with interface for the exclusive management of the Office of the National Water and Flood Management Policy.

RESULTS

Web application for water management and decision support has been designed with interface for the exclusive management of the Office of the National Water and Flood Management Policy. The web application was separated into two websites for different areas of management. One is <http://pdc.gistda.or.th/floodmanagement2/> for monitoring and managing the entire country. The other is “http://pdc.gistda.or.th/floodmanagement_bkk/” for monitoring and managing downstream area.