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DEVELOPMENT OF EARLY WARNING SYSTEM SITU GINTUNG AT FLOOD PERIOD (CASE STUDY: DISASTER SITU GINTUNG MARCH 27, 2009 IN JAKARTA-INDONESIA)

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ABSTRACT

Situ Gintung disaster that occurred on March 27, 2009 had caused a lot of losses. Thus, flood control as one of the mitigation to be important in order to manage flooding in the catchment upstream at Situ Gintung. Disaster-prone areas is Cirendeu Village, and Ciputat Timur. Lack of hydrological information which often leads to uncertainty inflow in Situ Gintung catchment area, so the integration system between real-time hydrological information to be runoff model needs to be developed.

Simulation development starts with giving input in real-time rainfall data generated from Automatic Rainfall Recorced at Situ Gintung (x: -6.30023, y: 106.76424). Data was sent by hydrological's station attendant to server room using Short Message Service (SMS). Furthermore, data that was received will be simulated by system directly to get flood forecasting calculation based on the catchment area of Gintung.

The results of these simulations provide time information (t) and peak discharge (Q) inflow flood hydrograph directly and earlier. Integration between Automatic Rainfall Recorced at Situ Gintung and Rainfall-Runoff model using HEC-HMS can provide flood hydrograph early. So that the peak water discharge and water level information can be informed earlier and as a tools for the local government for the next flood events prior to take decision earlier.

Keywords: Situ Gintung, realtime, Automatic Rainfall Recorced, Rainfall-Runoff model, HEC-HMS.

1. INTRODUCTION

Situ Gintung located in East Chester , South Tangerang , Banten Province is a small lake with puddles Minor 21.4 ha (2008) . Situ Gintung used as tourist attractions and water parks since the 1970s . It is part of the Watershed (DAS)

Cisadane sourced from Mount Salak and Mount Pangrango , Bogor Regency (PusAir , 2009) . Water runoff from Situ Gintung flowed through the channel along the ± 800 meters to Pasanggrahan River. On March 27, 2009 spillway around the weir experienced a catastrophic landslide that resulted in damage to both the building embankments and spillway and downstream channels up to the Pasanggrahan River . Situ Gintung breakdown due to water runoff that could not be contained by the dam . Victims in that downstream area is also very much at the time of the flood disaster . One of the problems is Situ Gintung flood forecasting is the lack of a means to determine the approximate amount of flooding that would be the inflow in Situ Gintung.

Based on the description above it can be concluded that the development of information technology in providing information flood on the flood period is needed to reduce the risk of very many people living in the downstream Situ Gintung. expected hydrological information recorded in each Automatic Rainfall Recordedcan be directly used in real time to give information the inflow discharge Situ Gintung.

This study aims to create a flood forecasting model design based on information technology which combines the results of the hydrological network monitoring by guards postal stream hydrology and rainfall models (flood forecasting) using HEC-HMS.

2. RESEARCH METHODS

The study was conducted through two (2) phases. Phase 1 is a hydrological analysis. Phase

2 is the design of a hydrological model of hourly realtime data into surface run-off.

2.1. Development Procedure of Early Warning System

Planning of the development of Flood Early Warning System in Situ Gintung watershed can be seen in Figure 1.

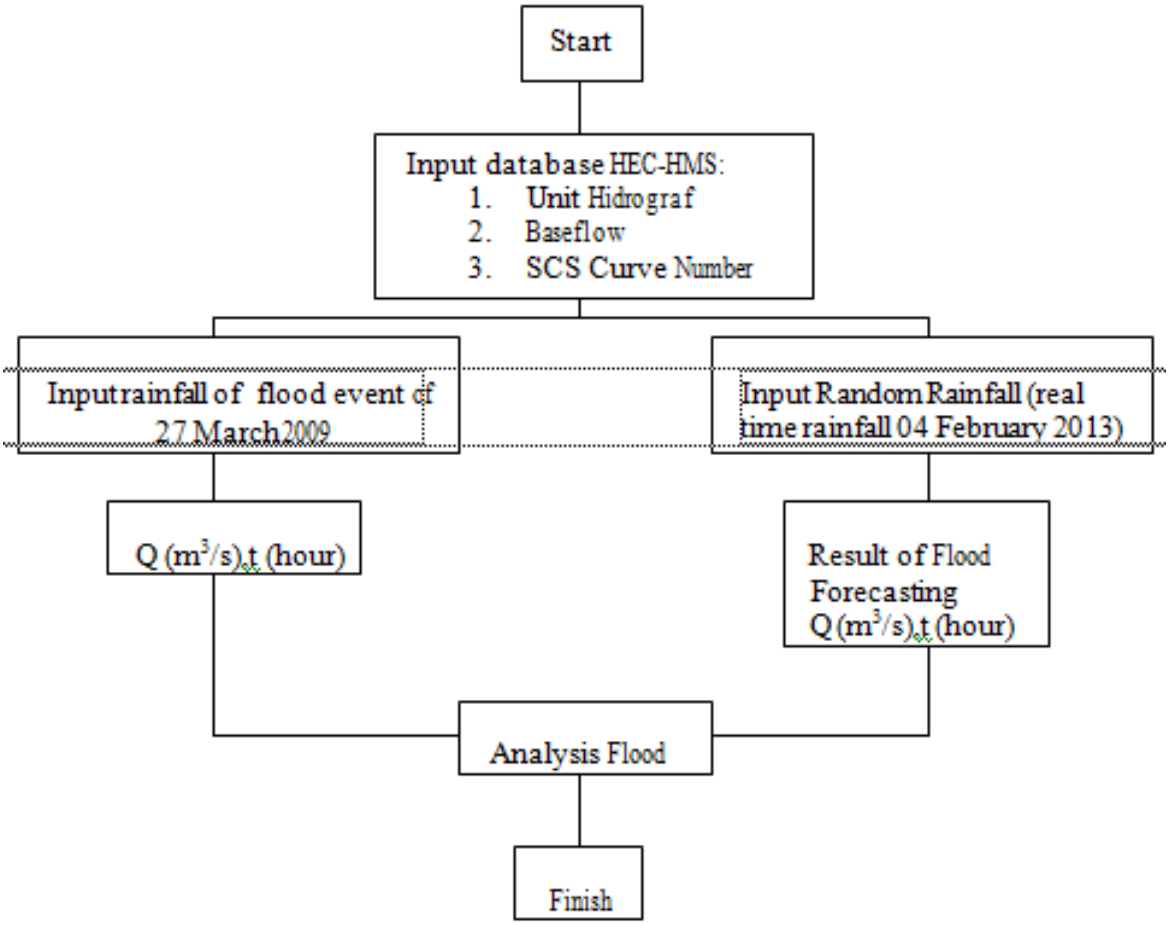

Figure 1. Diagram of Planning Development of Flood Early Warning System

2.2. Unit Hidrograph Analysis

In relation to the study of water resources, hydrology has a very important role, One contributing factor is the hydrological data. Couple hourly hydrological data and discharge data is very important in shaping the unit hydrograph. Below is a watershed unit hydrograph Situ Gintung of rain events 26-27 March 2009 (Figure 2).

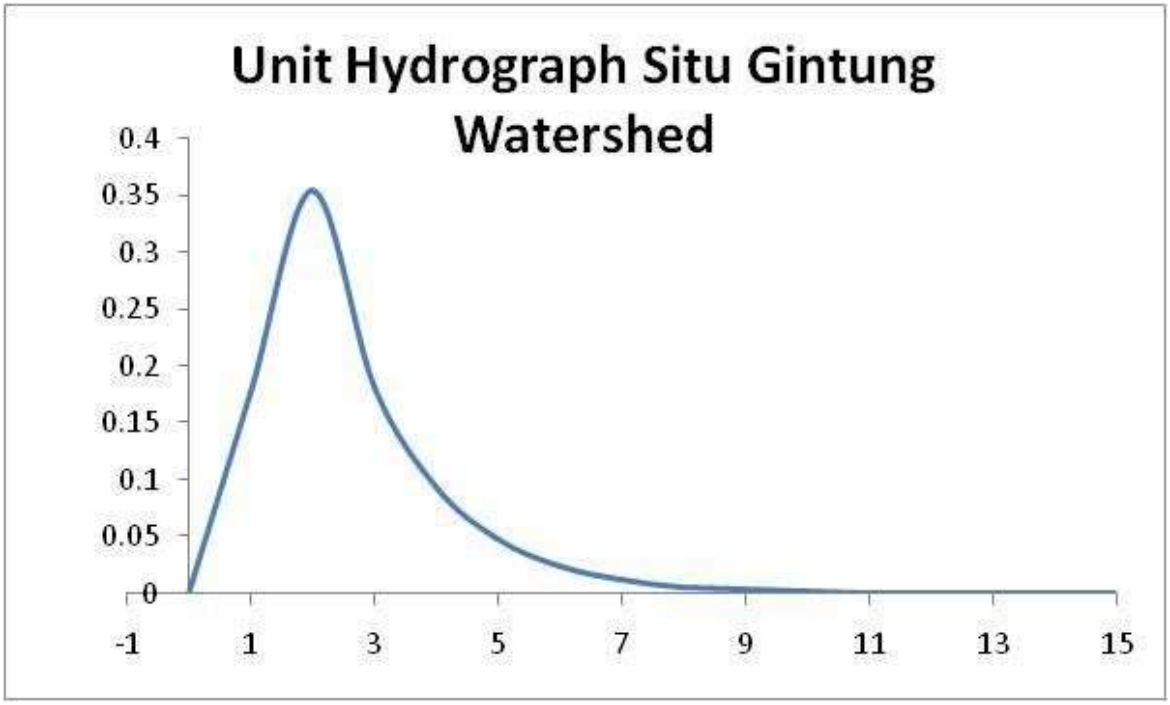

Figure 2. Unit Hidrograf DAS Situ Gintung

2.3. Model Input of HEC-HMS

In designing flood early warning system development, rainfall inputs are still inputing manually by the user to analyze the watershed inflow Situ Gintung. The data is then simulated using HEC-HMS software.

3. SIMULATION OF HEC-HMS

Rainfall data obtained from hourly rainfall data on 26-27 March 2013. Existing rainfall data can be simulated in HEC-HMS software. Figure 3 below shows the rainfall data obtained is ready for simulation.

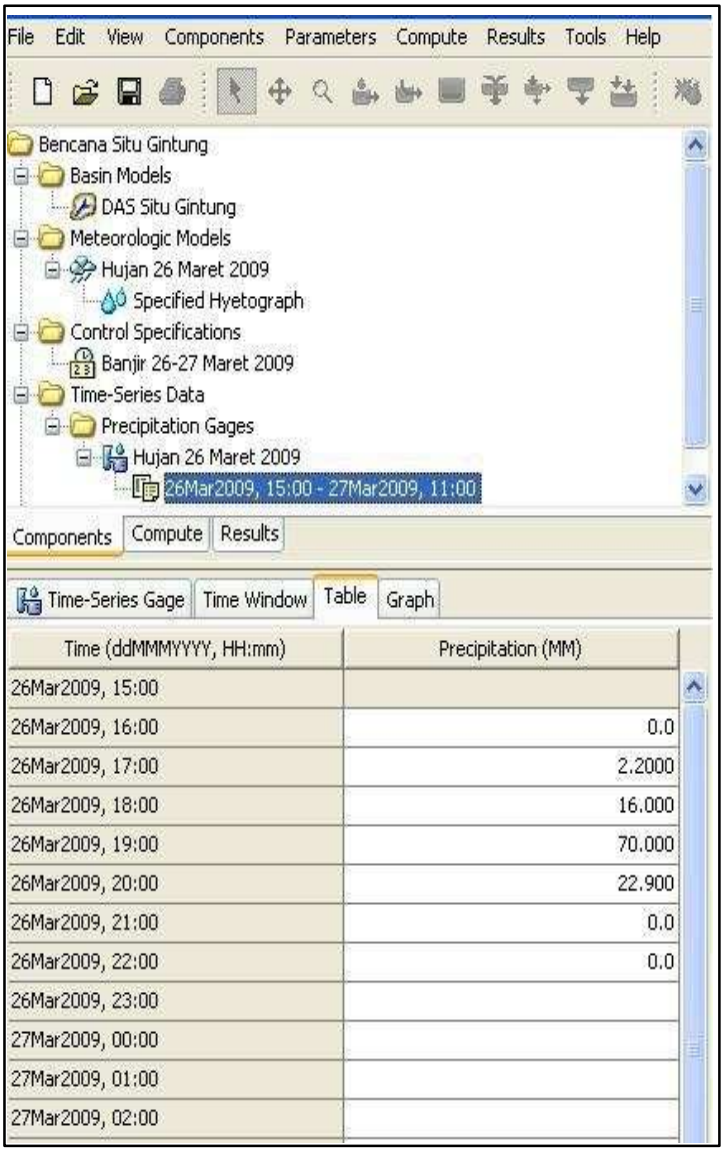

Figure 3. input Rainfall data watershed of Situ Gintung

Further rainfall data that has been entered, do "compute" in HEC-HMS software. Figure 4 below shows that being in the simulation.

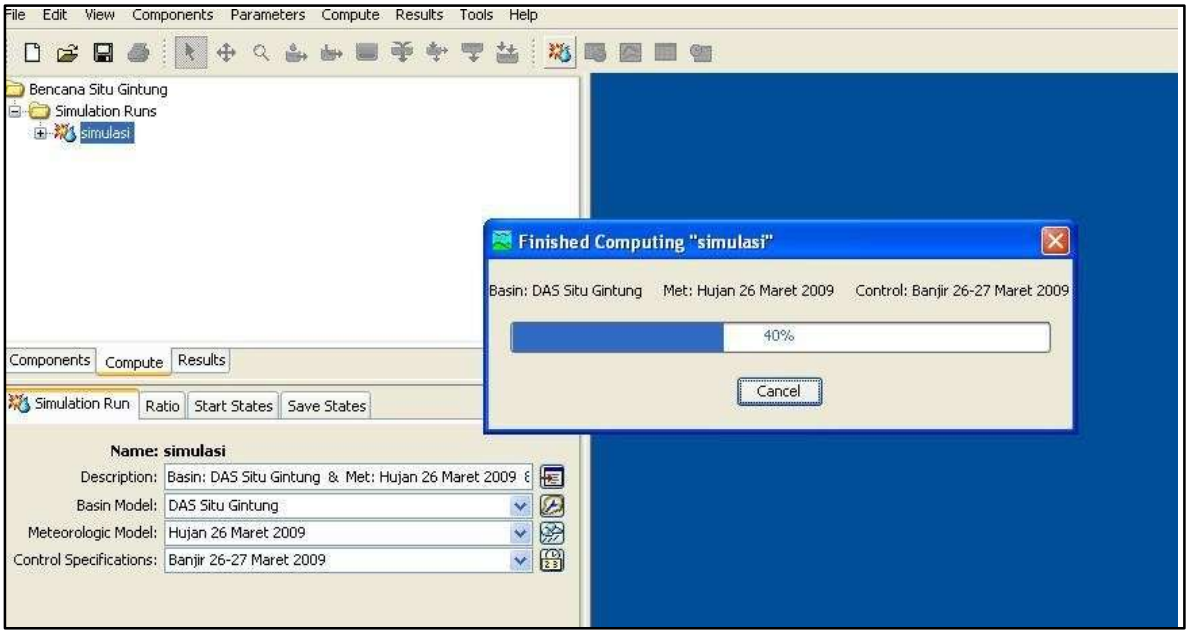

Figure 4. Flood Forecasting Simulation

After performing the simulation, the simulation results can be seen as Qpeak and Time (t) as shown in the following figure 5.

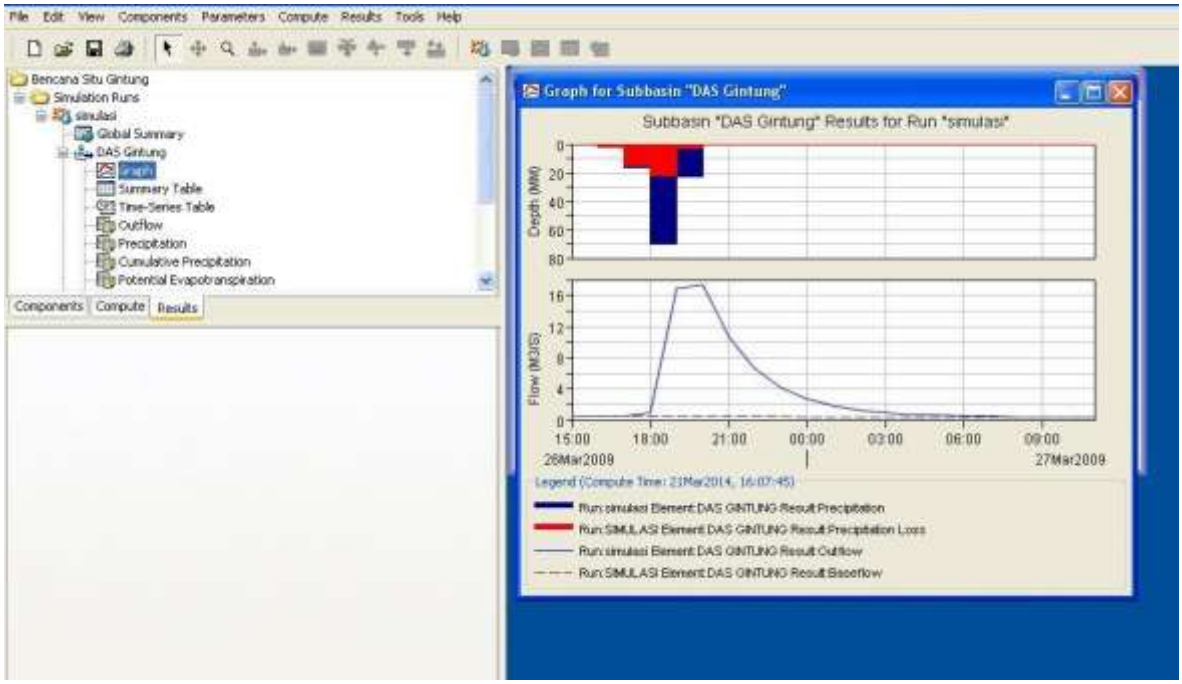

Figure 5. The result of simulation of HEC-HMS

4. RESULT AND DISCUSSION

4.1 Flood Forecasting Simulation of Situ Gintung Watershed

Hourly rainfall data are sent through the post guard messenging of aotomatic rainfall recorded was the location (x: -6.30023, y: 106.76424). The data comes from a guard post directly simulated by HEC-HMS. Below shows the peak inflow discharge data Situ Gintung which indicates that the peak discharge at the time of the flood event on March 27, 2009 amounted to 17 m3 / s.

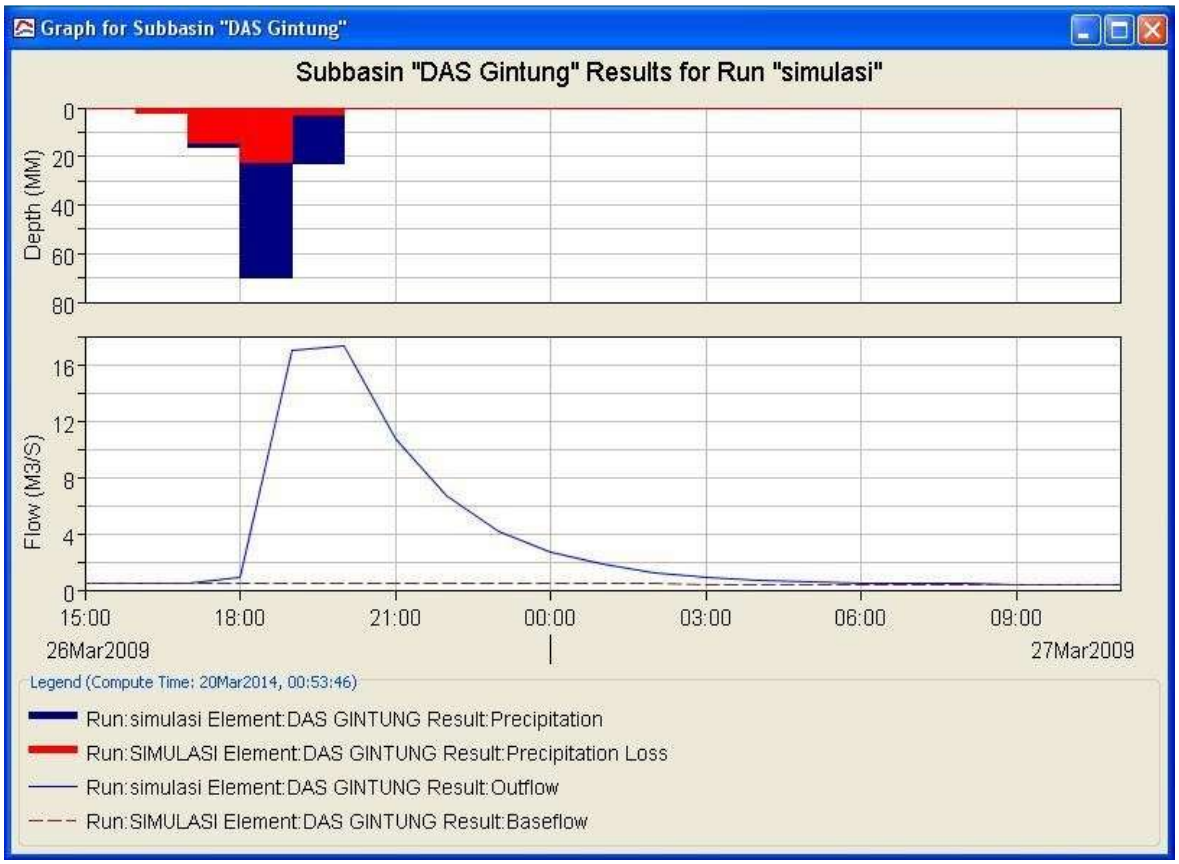

Figure 6 Flood Simulation on 27 March 2009

While the following is one of the simulation that shows real-time inflow with information of the rainfall input on February 4, 2013 (Figure 7)

Jam Ke-	Hujan
1	0
2	4
3	16,5
4	3
5	2
6	1

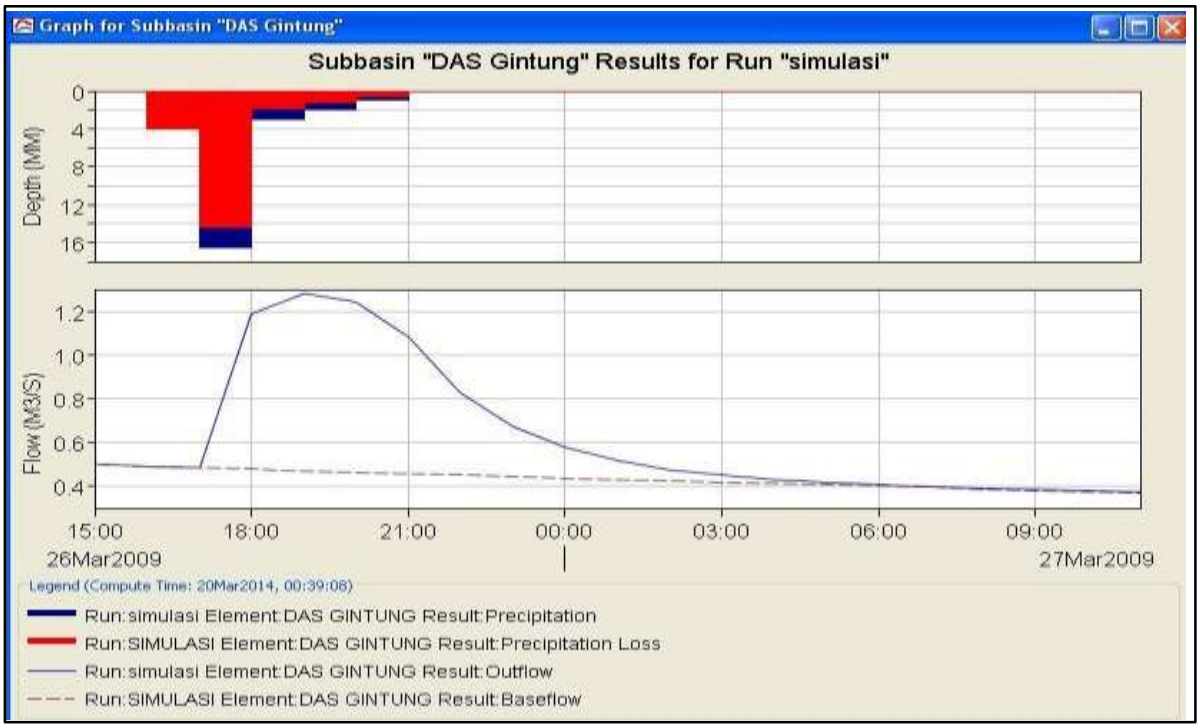

Figure 7. Flood Forecasting DAS Situ Gintung with on rainfall data at 04 February 2014

To reduce the impact of flood disasters which pretty much happening lately, then the role of an early warning system is needed. Therefore, by utilizing the existing flood events can develop a flood routing in watershed, that its purpose is to provide information Dishcharge (Q) and time (t) early so that losses due to disasters can be minimized. The following information can be inferred from the design development of the early warning at Situ Gintung Watershed.

Table 1. Example of Simulation of DAS Situ Gintung using HEC-HMS
(Comparasion flood event)

information	**Rainfall 26-27 March 2009**	**Rainfall 04 February 2013**
Discharge Max	17,3 m^3/s	1,3 m^3/s
Qpeak Hour	6	5

When compared with rainfall events dated March 27, 2009 that led to the collapse of Situ Gintung dam, then the information of rainfall on Friday, February 04 date has not been included in the category are quite alarming.

5. CONCLUSIONS AND SUGGESTIONS

5.1 Conclusions

Several conclusions can be demonstrated in this study are:

1. Simulation in the design development of the flood early warning Ssytem facilitate users in getting Qpeak and travel flood early arrival time.
2. This simulation can provide information to the public earlier.

5.2 Suggestions

1. Future studies may be the development of automatic data transmission, both of the guard post to the interface or from the Automatic Rainfall Recorded at the interface.
2. Furthermore, the model is calibrated to the subsequent flood events.

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