

# **FLOOD MONITORING WARNING SYSTEM USING FPGA**

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**AHMAD AL-ZUBIR BIN ZULKIFLY**  
**FACULTY OF ELECTRICAL ENGINEERING**  
**UNIVERSITI TEKNOLOGI MARA MALAYSIA**  
**40450 SHAH ALAM, SELANGOR, MALAYSIA**  
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## ABSTRACT

The paper describes the design and development of Flood Monitoring Warning System (FMWS) using FPGA. This system is based on the measurement of water level and flow rate in real time. The water level and flow rate sensors are used to indicate any changes on the water level or velocity especially during heavy rain. By monitoring the water level and flow rate of any rivers, it can buy sufficient time for resident to evacuate nearby areas, preventing loss of life and property. This system offers complete, low cost, low power consumption, ease of installation, and user friendly way of 24-hours real time monitoring of FMWS when compared with available systems which are either more costly or unreliable. The heart of the design is described using Verilog HDL (Hardware Description Language) and implemented in hardware using Field Programmable Gate Array (FPGA). This design is prototyped on Altera's Cyclone DE2 FPGA board.

**Keywords**— Flood Monitoring Warning System, Water Level Sensor, Water Flow Sensor, FPGA, Verilog HDL,

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# CHAPTER 1

## INTRODUCTION

### 1.1. PROJECT BACKGROUND

Flooding often comes unexpectedly and without early warning. It happens when there are heavy rains, when rivers overflow, when ocean waves come onshore or when dams or levees break. Flooding is the most common hazard in Malaysia and most floods that occur are natural result of cyclical monsoons during the tropical wet season, which are characterised by heavy and regular rainfall. Floods often cause damage to homes, business and sometimes floods can be deadly too. In Malaysia, flood forecasting and warning system infrastructure have been installed in nine river basins and the Department of Irrigation and Drainage Malaysia responsible in providing the flood forecasting and warning services to the public via website. The government also establishes GEOREX Monsoon Flood System, for the Klang River, which integrates remote sensing, Atmospheric and Radar-satellite model-based Rainfall, hydrological model and geographical information system (GIS) as flood monitoring system [1]. There are about 617 rainfall stations, 436 flood sirens stations installed in Malaysia for flood forecasting and warning system. However, these stations are still incapable to warn public about the flash flood.

Current systems are based primary on satellite and microwave imaging technique [1]-[2]-[3], which are expensive, can be inconsistent and hazardous and need complex algorithms use electromagnetic, chemical and radiation sensors for flood warning incorporate the effect of noise, humidity, temperature and winds are also provide in[6]