

UNIVERSITI TEKNOLOGI MARA

**FLOOD RISK MAP ANALYSIS
USING GEOSPATIAL AHP OF
FLASH FLOOD IN MUSCAT,
SULTANATE OF OMAN**

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ABSTRACT

The main objectives of this research is to assess the flood risk of Wadi Aday basin on coastal infrastructure and population, to develop a web - based GIS application and tools to view and analyze coastal flood risk and to propose DRR methods. The area that was selected is situated in Muscat, which is the capital of the Sultanate of Oman, and it contains the primary commercial sector of the city. The primary data that was used to conduct this study was aerial photography that was taken in 2012 and included outcomes such as DTM, DSM, contours, hydro network, and ground control points captured by field survey and photogrammetric software. On the other hand, the data that were used as the secondary data included the spatial maps, the population, and the runoff from the rainfall. It has been brought to the public's and decision makers' attention that the importance of remote sensing and GIS technique, along with other types of geospatial data, has been emphasised in order to present their significance in floods and to raise awareness among the general population. The AHP methodology was used to conduct the research, and it took into account a variety of factors, including geology, geomorphology, soil, slope, rainfall, sea level rise, drainage density, LULC, Elevation, distance from coast, and population factors. In this study, a comparison and contrast is made between the effects of flooding on the distribution of population, land use and land cover, transportation infrastructures, and building infrastructures. This study highlights the importance of high-resolution satellite images and advanced GIS tools in understanding the extent and impact of floods in a systematic and techno-scientific manner in the Wadi Aday basin. Flood risk map is delineated using multi criteria and AHP process and coastal flood inundation areas due to sea level rise are assessed using DEM based inundation model. Inundation areas based on localized rainstorm surge at critical points for 1m, 3m, 5m and 10m water surge were estimated. Impact of floods on coastal infrastructure and population where it is presented as flood risk is assessed and its impact is analysed. A web-based GIS application is developed, tools to view and analyze coastal flood risk are developed and DRR methods are proposed. The Web-GIS (QGIS) application and its role in decision making and the efficient management of flood risk are discussed in further detail. This study highlights the importance of high-resolution satellite images and advanced GIS tools in understanding the extent and impact of floods in a systematic and techno-scientific manner in the Wadi Aday basin.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

It is possible for flooding to be one of the most devastating environmental disasters that can take place anywhere in the world. It accounts for nearly half of all economic losses that are brought on by natural catastrophes, and it is anticipated that these losses would increase as a result of climate change due to the fact that floods will become more severe as a consequence of climate change (Rollasona et al., 2018). It is one of the most major natural disasters that has the potential to endanger both the prosperity and the safety of human communities.

Flood can be defined as change or deviation in the regular course of water due to excess volume of water carried during the certain period. One other definition of a flood is the level of inundation that occurs as a result of excessive water flow or overflow in a normal watercourse, such as a river, stream, or drainage. There is a reference to the concept of flood in the Old Testament (OT), namely in the Hebrew word "mabbul," which means "to flood" (Davidson, 2004). Further the term flood has been used mostly in biblical describing about the sins and bad happenings of the society. (Longman, 2016) says the term flood has its prominence from the history the same has been recorded in the biblical events as a pictorial representation in order to communicate the happening of Flood.

While discussing about the flood by and large, it becomes important to view the impact left over by the flood. The quantum of damages caused to the natural and manmade resources can be evaluated and their impact can be broadly said as "Disaster". The terminology disaster has its origin from Middle French during 1590 *désastre* and during 1560s in Italian *disastro* the literal meaning is ill-starred. Furthermore, astrologically it is defined as unfavourable star or planet due to which natural calamity has happened.

The term "disaster" can be stated in basic terms as damage caused by nature to natural resources as well as artificial resources. (UNSIRD, 2008) In the interest of promoting common meanings in the usage of the terminologies that refer to disaster, they have explained that a disaster is "a serious disruption of the functioning of a