



## Research Article

# Flood Disaster in Erbil City: Problems and Solutions

Shuokr Qarani Aziz<sup>1\*</sup>, Shawnm Mudhafar Saleh<sup>2</sup>, Sarkawt Hamarahim Muhammad<sup>2</sup>, Sarwah Othman Ismael<sup>1</sup>, Bahar Mohammed Ahmed<sup>2</sup>

<sup>1</sup>Department of Civil Engineering, College of Engineering, Salahaddin University-Erbil, Erbil, Kurdistan Region, Iraq

<sup>2</sup>Department of Water Resources Engineering, College of Engineering, Salahaddin University-Erbil, Erbil, Kurdistan Region, Iraq  
E-mail: shoker71@yahoo.com

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**Abstract:** Several floods occurred in Erbil City in 2021 and 2022, which caused disaster in the city. 12 people died, thousands of houses and vehicles were destroyed, and numerous public projects such as electric stations and roads were damaged as well. Specifying reasons and providing suitable solutions are essential for minimizing damages. Thus, this research aimed to identify causes and offer scientific solutions for minimizing flood damage in the future. Several site visits for the locations of floods were carried out. Quantitative and qualitative data collection was conducted. Based on the catchment properties and maximum probable rainfall, the peak flood is 250, 200, 90, and 70 m<sup>3</sup>/s for Roshnbiri Bridge, Roshnbiri-Daratu Culvert, Korean Drainage Valley, and Daratu Natural Valley, respectively. Heavy rainfall, partial or full clogging of some inlets, sewers, and culverts, obstructions in watersheds, altering the direction of normal flow, technical and design problems, and disposal of waste in watersheds are the main factors contributing to the flood. Cleaning watersheds, maintaining storm sewers, providing new diversion channels, proper design of storm sewers, culverts, and bridges, eliminating barriers on the usual streams, and studying the master plans of the new projects and cities are the main solutions for minimizing flood disasters in Erbil City.

**Keywords:** edisaster, flood, Erbil City, Geographic Information System, management, problem, solutions

## 1. Introduction

Nowadays, flood-hazard events are very common in the whole world. The main reasons are climate change and reducing impervious areas due to the increasing population [1]. Over the last century, the population of the world has markedly increased and will continue to increase; this rapid growth and unplanned urbanization have stopped the flow of water and filled the waterway. In general, it is predicted that by 2030, most of the world's population (about 60%) will stay in cities, and nearly 8,000 km<sup>2</sup> of land will turn into built-up areas in one year [2]. Converting farmyards, vegetation covers, and bare ground into concrete and grading surfaces has a great effect on hydrological processes and flooding. Climate change leads to an increase in the amount and frequency of climatological, meteorological, and hydrological hazards. This may expose communities to flood events. New research conducted worldwide indicates that flooding is currently the deadliest disaster compared to other natural disasters such as earthquakes and typhoons. Urban areas are the most affected by flooding due to urbanization. According to the hydrological data available in Kurdistan, Erbil City is largely affected by flood damage. Other factors that cause urban or pluvial flooding are reducing green areas, increasing urbanization, and discarding construction waste into drainage lines [3]. Moreover, as Iraq is a