International Journal of Innovation in Agriculture Sciences and Rural Development
Vol.5, NO.2 , P:69- 74
Received: 19 July 2024
Accepted: 28 October 2024

Causes and effective factors in the formation of floods

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This article is taken from the doctoral thesis of Rasul Darab Khani (author responsible for the article) with the title; Presenting the appropriate model of urban flood crisis management in Ilam, Tehran University (Kish International Campus).

Abstract

Flood is one of the most important natural hazards in the world. Natural and human factors are involved in floods together. Human factors such as blocking canals or improper use of land, deforestation in areas with rivers and urban development along with encroachment on river boundaries and creating impervious surfaces are the most important of these factors. The causes of floods have been discussed.The findings of the research show that the dimensions and factors affecting the occurrence of floods can be classified as follows: institutional-management; It contains features related to risk reduction, planning and experience of previous disasters and is affected by the capacity of communities to reduce risk, the employment of local people in risk reduction. Physical-environmental; Assessment of community response and post-disaster recovery capacity such as shelters, housing units and infrastructure such as pipelines, roads and their dependence on other infrastructure. Its variables include the following; land use - type of housing - building quality and age - building ownership - green spaces - density of the built environment - accessibility and geographical and social characteristics; It is obtained from the difference of social capacity in reacting positively to adapt to changes and maintain adaptive behaviors and recover from accidents. Its variables include the following: level of awareness-quality of life-attachment to the place and desire to maintain cultural standards. Economic; The response and adaptation of individuals and communities so that they are able to reduce the potential damages caused by accidents. Its variables include the following: income and suitable job conditions-insurance-savings.

Keywords: crisis management, flood, human factors, natural factors

Introduction

Recognizing and building capacity to deal with floods for communities that are increasingly facing natural disasters (Kuhlicke, 2011). As a basis for developing strategies to deal with special needs, it will be important and necessary to allocate resources, priorities and standards in ensuring public security(Kaewkitipong and eatal, 2010). The rapid physical development of cities in watersheds and the excessive expansion of cities in the boundaries of rivers, canals and drylands have intensified in recent years, and the consequences and damages caused by the flooding of urban rivers have also multiplied. Basically, the rivers and even the drylands become flooded and flood the surrounding lands and their exceptional beds. In the meantime, the formation and expansion of urbanization and, as a result, extensive land use changes around rivers reduce the return period of floods and also the amount of time for water to concentrate within the catchment basins by several times(Kerimi Soltani, 1392: 193). It can be said that the main cause of flooding is excessive rain. Although short-term intense and continuous rain is needed for it to occur. But the way the rain falls, destroying forests and building roads and houses increases these conditions for many reasons. Urbanization also increases floods for various reasons, some of which are: :

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1. Production of impervious surfaces such as streets and roads that cause rainwater to turn into runoff at a faster rate.

2. Hydraulic construction surfaces have always contributed to the underground sewage and underground water networks and cause water to be sent quickly into the canals, and this itself can be one of the reasons for the increase in floods.

3. On the natural channels of the rivers, slabs are placed with other facilities that reduce its capacity. The volume of complex water behind this facility causes flooding.

4. Due to the increase in population and the development of urbanization, more runoff is produced and sewage systems cannot be a good deterrent to the maximum flow (Department of Crisis Management of Isfahan Governorate, 1391: 101-103).

Continuous floods in many areas have caused great damage to the agriculture, fisheries, housing and infrastructure sectors and have severely affected social and economic activities(Guo,2014:947-965). so that during the years 1900 to 2015, due to the occurrence of floods, the death of 7 million people and 600 billion dollars of damages have been reported. It is due to the spread of such accidents that the necessity of conducting a lot of research is always raised. The causes of floods should be looked for in natural and human factors. Flooding takes people's lives and damages their properties. In developing countries, cities are growing rapidly. Unprecedented migration to cities has led to the emergence of growing settlements and uncontrolled dispersion of areas, and at the same time, it has led to the unbridled growth of industry and infrastructure development. On the other hand, urban areas have great economic value, and when a flood occurs in these areas, they leave a heavy financial loss and cause disasters that delay urban development for years. These conditions have made urban centers face a big challenge and the statistics show that governments at all levels should urgently check the adequacy of their plans to deal with natural disasters (selva,etal,2020). Therefore, with this introduction and in the continuation of the current research, we discuss and investigate the causes of floods.

Causes of floods

Factors affecting the occurrence of floods can be divided as follows (Mozaffari, 2013).

A: Natural factors: These factors include the investigation and study of the physiography of small river basins outside the city limits, whose natural flow path passes through the urban space.

Natural factors can be classified as follows:

1. Geometric characteristics of the area: such as the surface, environment, shape, position, average slope of the main waterway and...

2. Characteristics of the soils of the area: soil type, soil particle size, texture, structure, erosion ability, permeability, etc.

3. Vegetation: type of plants in the area, distribution of vegetation, water leaves, transpiration, etc.

4. Hydrology: surface maintenance, underground water, floods, seasonal and seasonal flows

5. Geology: the structure of rocks, seams and cracks, types of rocks, faults and folds, etc.

6. Water and air: temperature, amount and type of rainfall and frequency of their occurrence

7. Sediment load: erosion, transfer and deposition, destruction and sediment-prone areas of the basin

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b) Human factors

1. Human operations at the level of watersheds outside the city limits include: agricultural operations, animal husbandry, road construction, and facilities outside the city limits.

2. Human operations at the level of cities: the increasing trend of urbanization and urban development and impermeable coverings on the surface of the earth increases the probability of flooding in residential areas every day.

Some of the factors and human interventions in the cities that lead to flooding are as follows:

A: Interfering with canals and manipulating waterways:

In cities where the problem of land is acute and the amount of demand is more than the possibility of handing over land, encroachment on the sanctuaries of rivers and canals has become a normal thing. have been its implementation. In some urban areas, natural restrictions caused by the slope and topography of the land have also limited the possibility of urban development in these areas.

B: Lack of sufficient attention in complying with the regulations of the urban planning authorities

Failure to pay attention to the morphology of the city in terms of natural directions, the slope of the land, and the presence of depressions causes that despite the small amount of rainfall in the cities, the residential points that are established in the boundaries of the canals and the ranges leading to the mountains are exposed to floods. . Flooding on the surface of the streets and crossings of Wazirgoz, especially in the cities of Bashib, are not considered normal phenomena.

C: Absence of urban sewage systems: One of the major problems and bottlenecks of most cities is the lack of urban sewage systems and the lack of necessary forecasts in urban design, based on the creation of a surface water collection network and even tables with a suitable width and slope for Conduction of surface water.

D: Failure to observe the principles of study, design and implementation of flood control structures and facilities

Flooding and overflow of water from many flood control structures such as flood walls or destruction of these structures due to foundation settlement or washing water, erosion and improper implementation of these facilities have clearly caused damage in urban areas. The culverts due to the sedimentation of the floods at the bottom of the culverts reduce the efficiency of the culverts and cause water to flow back and overflow into the areas surrounding the culverts and urban flooding. (Mozaffari, 2013: 204 to 208).

Also, Kamal Omarid (2017) listed the factors affecting the power of flood damage as follows:

1-Climatic factors

Certainly, if there is no rain, there will be no flood, so the occurrence of flood is primarily dependent on the rain. On the other hand, every rain does not lead to a flood. Therefore, the origin of many huge floods is the rains that come in the form of showers with high intensity, relatively long duration, Repeats occur sequentially or over a wide area.

2 - Basin factors

Catchment basins as the origin and source of floods should be identified and the role of physiographic characteristics, changes and developments that occur over time and according to land exploitation plans, development and expansion of other activities at the basin level, should be considered. Some of these important factors are as follows.

a. Basin size:

Although large catchments produce more runoff compared to small catchments, but the amount of runoff per unit area of the catchment

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area decreases due to the increase of its area, because in wide areas, the intensity of precipitation is uniform and variable, and in this sense, establishing the relationship between runoff and intensity Rainfall is useless in wide basins, and the said correlation can be found in small basins with uniform rainfall. The larger the basin, the more rainfall it receives, but usually the peak discharge of larger basins is relatively lower than smaller basins.

b. Basin shape:

The longer the shape of the basin is, the smaller the flood peak is.

Round basins with a short concentration have a larger peak discharge than the same level but elongated basins.

Because during a shower, the risks of additional precipitation spend less time to reach the outlet of the basin

P. Slope of the basin: the effect of night on the amount of runoff is caused by its effect on the depth and retention of water and soil, as well as the opportunity for water to penetrate into it and the amount of water infiltration into the soil.

T. Basin drainage network:

The flow in waterways is faster than the surface flow on the ground, so the higher the capacity of the reservoir, the faster the runoff accumulation speed and the steeper slope of the hydrograph curve. Usually, for the same conditions, the tree shape is more capable of producing discharges. It has a peak compared to other geometric shapes.

Th. Slope of the main waterway:

The slope of the waterway mainly influences the water movement and drainage of the basin, and as a result, the amount of losses in the waterway, is effective in the level of irrigation of the basin. Steep rivers have less irrigation compared to the low-slope types, but on the contrary, they have a higher peak discharge.

J. The geological and soil conditions of the basin

The characteristics of lithology and geology have a significant effect on the level of water permeability and the creation of direct runoff and, as a result, the basin's flood risk. How to discharge sub crustal water and shallow underground water into the river, which is affected by the geological features, has an effect on the base flow and consequently the flood discharge.

d. Vegetation:

The presence of vegetation on the basin level is one of the factors that reduce the flood risk of a basin due to its effects on the components of the hydrological cycle at the basin level. Or it doesn't happen at all. It can be said that flood trending in catchment areas with more vegetation shows its role in the parameters of roughness coefficient and infiltration.

Z. Land use:

The use of land affects the flow of the river and the occurrence of floods in different ways. For example, the destruction of vegetation or changes in the cultivation of plants that do not have large water losses cause an increase in the volume of the flow and the spatial discharge of the flood. Any operation in the basin that It causes a decrease in soil moisture storage or a decrease in permeability, it causes an increase in flood discharge. Too much livestock causes soil compaction and loss of vegetation, and on the other hand, the construction of delay and adjustment reservoirs causes a decrease in flood discharge (Omidred, 1397: 188) -192).

But in a general classification, the dimensions and factors affecting the occurrence of floods can be classified as follows:

1- Institutional-managerial: it contains features related to risk reduction, planning and

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experience of previous accidents, and the employment of local people in risk reduction is affected by the capacity of communities to reduce risk. Its variables include the following; Infrastructures, the operation and performance of related institutions, the number of trained forces, how to manage or respond to accidents, such as organizational structure

2- Physical-Environmental: Assessing community response and post-disaster recovery capacity such as shelters, residential units and infrastructure such as pipelines, roads and their dependence on other infrastructures. Its variables include the following; Land use - type of housing - building quality and age - building ownership - green spaces - built environment density - accessibility and geographical features

3- Social: It is obtained from the difference of social capacity in reacting positively to adapt to changes and maintain adaptive behaviors and recover from accidents. Its variables include the following: level of awareness - quality of life - attachment to the place and the desire to maintain cultural standards

4- Economic: the reaction and adaptation of individuals and societies so that they are able to reduce the potential damages caused by accidents. Its variables include the following: income and suitable job conditions-insurance-savings (Noriris, 2008).

Conclusion

Factors affecting the occurrence of floods can be divided as follows; Natural factors: These factors include the investigation and study of the physiography of small river watersheds outside the city limits, whose natural flow path passes through the urban space. Natural factors include the following: geometric features of the watershed,

Characteristics of basin soils, vegetation: type of basin plants, hydrology, geology, water and air, sediment load.

The human factors involved in the occurrence of floods are as follows: Human operations at the level of catchment areas outside the city limits: include agricultural operations, livestock, road construction, and facilities outside the urban limits. Human operations at the city level: an increasing trend. Urbanization and urban development and impermeable coverings on the surface of the earth increase the probability of flooding in residential areas every day. Some of the factors and human interventions in the cities that lead to flooding are as follows: Interference in the canals and manipulation of the waterways, lack of attention in complying with the regulations of the urban planning authorities, lack of urban sewage systems, failure to comply with the principles of study, design and implementation. Flood control structures and facilities.

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