

Solutions for flood control

Floods, despite the great damage, can be considered an opportunity due to the many benefits such as: storage of huge water resources, filling of aquifers, washing of eroded soils from recent years and replacement of arable land.



Green is for flood spots, and yellow is for roads

Introduction

When it rains and snows, some water is absorbed by the soil and plants, a percentage evaporates, and the rest flows and is called runoff.

Flooding occurs when soil and plants are unable to absorb rainfall and as a result the natural channel of the river does not have the traction of runoff. On average, about 30% of rainfall is

converted to runoff, which increases with melting snow. Floods that occur in different ways create an area called floodplain around the river.

River floods are often caused by heavy rainfall, which in some cases is accompanied by melting snow. A flood that flows into a river without warning or a little warning is called a flash flood.

The death toll from these flash floods, which occur in small areas, is generally higher than the death toll from floods in large rivers. Extreme levels of flood danger were announced in small areas, usually higher than in large rivers.

Coastal areas are also exposed to flooding caused by waves from severe storms on the surface of the oceans or waves caused by earthquakes. Floods not only damage property and endanger human and animal lives, but also have other effects. Runoff from heavy rainfall causes soil erosion upstream and sedimentation problems downstream. Habitats for fish and other animals are often destroyed by floods. High flow velocity increases damage. Prolonged floods stop traffic and impede drainage and economic use of land. Bridge supports, riverbanks, sewers and other structures are damaged, disrupting shipping and hydropower generation. The economic costs of floods around the world are estimated at tens of billions of dollars annually.



How to deal with floods

In general, in the face of the phenomenon of flood and the control and relative reduction of human and financial losses resulting from it, there are three perspectives: structural, non-structural and combined. From a structural point of view, flood control, by organizing the river and constructing flood control buildings such as: reservoir dams, delay dams, creating longitudinal coastal embankments and dam walls, correcting the route and cross section of the river, digging auxiliary floods, constructing irrigation stations and building stations. Watershed, partial control of destructive floods is possible. Since the 1950s, the use of structural criteria has been questioned as the most effective solution to contain and reduce the human and financial losses caused by floods. In the non-structural view, by predicting the magnitude of the flood downstream and in the vicinity of population centers, it is possible to issue the necessary warnings to evacuate the population centers. Installation of flood warning systems makes it possible to contain and partially reduce flood damage.

It is clear that in all three perspectives, access to the intensity and magnitude of destructive floods in the vicinity of population centers by monitoring the phenomenon or its simulation is essential.



Urban flood

By changing land use from farms and forests to streets and buildings, the earth's ability to absorb rain decreases. Urban lands produce 2 to 6 times more runoff than virgin and natural lands.

During an urban flood, the city's streets and alleys become fast-moving canals and canals that can disrupt city life and cause extensive damage. In general, floods that occur in cities. Damages caused by it are divided into direct and indirect categories.

Sudden flood in the city

Lack of dredging of rivers and inner city rivers on the one hand, eliminating the permeability of water in the soil inside cities, which is usually asphalt and is generally accumulated by soil and garbage is one of the factors that cause urban floods.

The most important flood damage

Demolition of bridges, destruction of roads, destruction of agricultural lands, destruction of wells and aqueducts and destruction of dams and dams, destruction of houses, increase of carriers (malaria), water pollution, destruction of crops and domestic animals (Malaria) Damage to health and communication facilities.

Flood losses are related to land cover and water pressure. Floods can move water or sewage pipes. In one case, 5 km of a 90 cm water pipe was flooded.

Water treatment plants and pump houses may be submerged and mud inside the pumps, motors and other equipment may be expensive and time consuming to repair. Damage to protective structures for wells and springs may lead to contamination of drinking water. Sewage treatment plants and sewer pipes are more exposed to flood damage. Water backflow in sewer pipes is more prone to flood damage. Reflux of water into sewer pipes causes overflows of manholes, waste tanks and sewage wells. Due to the rising water level, various types of waste are scattered in different places, which causes significant problems in their collection and disposal. The accumulation of garbage and excrement increases the number of flies and rodents. Burying the

dead and burying the carcasses of dead animals sometimes creates an immediate and important problem.

Surprisingly, the risk of fire also increases during floods. Rising water levels may cause oil or gasoline tanks to overturn, or water entering fuel leaf tanks may cause them to spread over a large area. If a spark reaches these fuels, the fire quickly spreads everywhere, because floating on the surface of the water and other objects are usually all workable materials. Sometimes the connection to the power grid of submerged buildings can cause fires and electric shocks. Coastal facilities may be destroyed during the onslaught of these waves or may be damaged by landslides and landslides.



Factors affecting the occurrence of floods

The causes of floods can be broadly divided into three categories: climatic, physical characteristics, and human activities. The main cause of floods is rainfall. The physical properties of the basins cause large amounts of rainfall to be converted into runoff. The following is an overview of the major causes of flooding.

1- Climatic factors

These factors include the following:

Excessive rainfall, cyclonic showers, heavy rainfall in small-scale basins, precipitation and snowmelt.

2- Physical characteristics of the basins

Soil moisture level, groundwater level before rainfall, natural infiltration rate, impermeability of rocks forming the basin, type and geometric shape of the basin.

3- Human activities

Among the human activities, the following can be mentioned:

Increases land use change in runoff

Violation of rivers prevents the flow

Upstream drainage increases flood peaks

Climate change affects the frequency and magnitude of rainfall and floods

In fact, the pressure of the population is bio-development, which is accompanied by net economic benefits. It is one of the ways of flood penetration in a geographical place. How does a person contribute to a flood? The passage of water is a natural flow, and river floods are a constant danger when it becomes an accident when humans occupy it. As a result, increasing the population in a limited area increases the possibility of flooding. Protective facilities do not reduce the possibility of occurrence to zero, but by increasing the pressure on the water, its destructive damage is very high. Deforestation is actually eliminating the reduction of water absorption by the soil. As a result, the possibility of flooding increases. Degradation of pastures, forests, increasing roads, buildings and urban development, and misuse of lands are major human and artificial causes of floods.

Flood forecasting

The purpose of flood prediction is to estimate the flow rate and level of a flood that is likely to occur over a specified return period (for example, over a period of 25, 50, or 100 years). The

results of this prediction, called design flood, are used as a basis for selecting flood response methods. Design flood is usually selected based on the cost required to control it and the amount of risk that the destruction of the proposed flood control system poses to human lives.

In cases where the rupture of a water structure results in the loss of human life and property, flood-based design is performed with a lower probability of occurrence and a longer return period, such as a 1000-year flood or even longer.

The level of spread and height of these floods is higher than the floods that are more likely to occur. Design flood forecasting is done in two ways, analytical and geological, which are often complementary to each other. Factors that are considered for analytical flood forecasting include the following.

Topographic study of a part of the catchment that provides water flow to the study area.

Determining the type of land cover (rocks, soil, plants) to estimate the ratio of runoff to infiltrated and evaporated water.

Determining the largest possible showers and rainfall according to the available data.

Pay attention to the season, because conditions such as the earth being saturated with water or its surface covered with snow have a direct impact on the surface flow of water.

Determining the storage capacity of the main river bed and the surrounding floodplain, possible changes in the storage capacity of the lower parts of the river in the future should also be considered.

Importance of flood prediction

Knowing how the flow, volume, intensity, duration, location and finally the occurrence of floods are of particular importance in the design and maintenance of engineering structures, especially water facilities, as well as predicting the risks and potential damages caused by floods. Due to

the climatic conditions of our country, floods, whether spring or due to snowmelt or sudden storms, form a major part of the surface flow of most of the intestines in the central basin.



The measurement of river discharge in our country started 40 years ago and first from the rivers around Tehran. The network of stations for measuring the level of water and the amount of intestinal flow in the country (hydrometric network), currently has 870 stations, part of which is active. The country's hydrological network includes stations for measuring water, evaporation, rain, snow and water quality and sedimentation laboratories under the supervision of the Water Resources Surveillance Office of the Ministry of Energy. Floods are usually caused by the following factors:

Rapid rainfall and lack of capacity of the place of descent.

Lack of permeability of the ground and rapid melting of snow.

Lack of capacity and lack of proper design of river route and floods

Do not use flood barriers and protective walls in flood-prone areas

Lack of capacity for rocks and atmospheres to pass water in urban areas and blockage of the river due to mountain fall

Lack of river dredging and accumulation of heavy and abnormal sediments behind dams.

Damage to dams, dams and water tanks.

Immunization process

The flood damage protection process includes a variety of measures that are taken before an accident occurs to control and reduce the potential loss of life and property caused by floods. The immunization process is studied in the form of pre-flood and post-flood recommendations.

Important tips before floods

As we know, floods are natural disasters that occur every year in different parts of the world and cause a lot of financial and human losses.

The guidelines for dealing with such emergencies are as follows:

The principle of mental health is to maintain composure and empathy with others with hope in God Almighty. Never forget this.

Flood warnings in the media mean that floods have occurred or will continue to occur, so be prepared in advance.

Always have a Red Crescent rescue kit at home.

Get the information and knowledge you need from various sources such as radio and television and other means of communication, such as wireless and law enforcement.

Store in a safe water source for floods.

In flood-prone areas, life and financial security against potential losses are essential, so it is best to keep documents and securities in a safe box.

Keep in mind where you can go if you are told to evacuate. So choose several places in advance.

Always have some petrol in the tank as you may have to leave the house.

Get acquainted with flood-prone areas. For more information, you can contact your local Red Crescent Center.

Install the electrical panel on the upper floors of the building.

Insure your family and property against floods.

Avoid building your home or workplace in places where there is a risk of flooding.

Have enough bricks and sacks and enough sand in the house.

Keep your documents, papers and banknotes in plastic bags in a safe place.

If house entrances or windows are at risk of flooding, cover their edges with sandbags.

Move carpets and valuables to higher floors or levels.

Fill plastic containers, sinks, and bathtubs with clean cold water.

Use bricks to raise the level of home furniture.

Always consider the fastest and safest way to reach the nearest high point in your area.



Always have a battery-powered radio, flashlight with battery, and first aid kit.

Providing drinking water and canned food will save your life in some situations.

It is necessary to prepare sandbags to prevent water from entering the house

Recommendations for executive bodies to prevent and deal with floods:

It is necessary to equip some important centers such as medical centers with generators to generate electricity.

The need to observe the principles and rules of river engineering in the construction of bridges according to the standard.

Study and implementation of flood warning system plans (densely populated areas, mountains and large rivers).

Protecting and preventing unauthorized entry and occupation of rivers and canals.

Cleaning and disposal of natural and artificial accumulations in the area of bridges and underpasses in coordination with regional water companies.

The need to use the experts of regional water companies in case of floods in order to record flood statistics and damages and standardize statistics and information and use the expert opinions of regional water companies in analyzing the causes of flood occurrence and intensification and how Dealing with and reducing damage during floods.

Installation of flood warning signs in the path of flood-prone rivers (in special and important places and according to the conditions of rivers and flood routes).

Establishment of flood warning and management system (small and densely populated mountain areas - urban areas - large rivers).

The need to use and develop the role of insurance in investing in flood prevention and compensation plans.

Providing public education services through the Red Crescent Society, education and public media in coordination with sub-committees for flood prevention in the provinces.

River bed improvement:

A) Widening the riverbed

B) Deepening due to dredging

D) Naked the river of plants

E) Leveling of rivers

C) Correction of the route to reduce the length of the river

Flooding:

- A) Creation of walls along rivers.
- B) Digging transverse channels and obstacles in the path of flood.
- C) Diverting the accumulated water to other areas.
- D) Creating flood breakers in the valleys to prevent water accumulation

Construction and construction of dams and dams: It is the best solution that can be used in electricity generation and irrigation.

Protection of riverbeds: in high basins using construction materials.

Biological protection: Do not plant trees along rivers and create vegetation and forests to reduce the speed of raindrops.

Creation of concrete and stone breakers in the river bed and flood path

Flood time recommendations

If you are outside the building (office, residential), stay calm.

Cross paved roads and do not approach places where they may collapse.

If you have to leave your home and residence, be sure to turn off the electricity, water and gas before leaving.

Listen to radio and television messages for information and instructions, and do so immediately if evacuation is ordered.

When a lightning strike is announced:

If you think the flood has already started, leave the house immediately as you may have only a few seconds to escape.

Listen to the alarm to leave the house immediately in case of flood.

If your car is stuck in rapidly rising waters, drop it immediately and go to a higher place.

Drive slowly and watch out for breakdowns and road slopes.

Use heavy gears while driving; Because the brakes in the water do not work well.

If your house is in a high place, stay there.

Go to a high point away from rivers, streams, streams and drains.

If you are on foot, do not cross areas where the water level is above the knee.

Maintain the principle of composure always and everywhere.

Listen to the radio, television, or public loudspeakers for information about the situation and to receive the necessary instructions. If an evacuation order is given, do so immediately.

Provide lighting fixtures (flashlight, candle, etc.)

Save some food and water quickly. (Water sources may be contaminated and food may not be found) and food should be avoided in contact with floods and without a waterproof container.

Eat healthy canned foods.

Outside the home, look out for electrical wires that have fallen (especially in water) one day so that you do not get electrocuted.

When driving, be careful of slopes and curves of the road. Drive slowly and calmly (brakes do not work well).

If your house is in a high place and the risk of flooding does not threaten you, there is no need to leave the house.

Leave low-lying areas immediately.

Go to a high point away from rivers, streams and drainage.

Avoid seemingly gentle sewers and streams. And avoid entering fast-flowing water, regardless of the ability to swim, which carries the risk of drowning.

Floods that cover roads and bridges are unimaginable.

Walking or driving in a flood is the most dangerous thing you can do.

Transport vehicles, farm animals and transportable objects to the nearest high place. Cars and vehicles are not safe places against floods because the car may break down in running water or be moved by water.

Keep insecticides away from water as they may cause dangerous contamination.

Never run this way and that alone in a flooded area.

The water collected in the pits is suitable for the growth of insects, especially mosquitoes. Therefore, use a net at the place of residence and wear long-sleeved clothes and high-heeled boots.

Get to the nearest high and safe place quickly.

Get away from the flooded area as soon as possible

Turn off the electricity and gas supply to the house. Close the wells and close the canals and water inlets with sandbags.

Never walk in the direction of a flood

If you get stuck in a flood in your car, get out of it immediately

Listen and act carefully on the safety advice of the authorities on the radio

Safety tips after a flood

Get to know flooded areas. If you are unsure about these, contact your local Red Crescent Society.

Listen to the radio for information and instructions.

Provide first aid to the affected people and seek help from others if needed.

Stay away from flooded areas unless you have been asked or can help.

Avoid hanging wires and main water sources and damaged sewer networks and report these to the authorities.

Floods damage power lines and cause fires. This destruction can spread fires in fuel depots.

If you are on foot, do not cross areas where the water level is above the knee.

Try to put out small flames and call the fire and emergency services immediately.

Degraded water sources may reduce water pressure. Pay attention to the above point when extinguishing the fire.

In the flooded area, watch out for snakes as the flood pulls snakes out of the nest.

After a possible flood, there is an outbreak of infectious diseases such as gastrointestinal infections caused by various microbes and viruses (Shigella-Escherichia coli-hepatitis and tuberculosis) that need to be taken care of personal and public health and water and food hygiene.

Clean your house and residence immediately.

Living in the highest safe place until the flood risk is announced by the authorities

Be careful of the risk of transmitting electricity through water after returning home

Investigating the risk of collapse of the roof and walls of the house

Boil water before consumption and discard foods that have been in contact with flood water

Refer to the nearest medical centers in case of any serious injury.

Cross smooth roads and do not approach places where they may collapse.

In the flooded area, watch out for snakes as the flood pulls snakes out of the nest.

If you think the flood has already started, leave the house immediately as you may have only a few seconds to escape. If your home is flooded, take refuge in the highest point of the building.

Listen to the alarm to leave the house immediately in the event of a flash flood.

If your house is in a high place, stay there.

Go to a high point away from rivers, streams, streams and drains.

If you are on foot, do not cross areas where the water level is above the knee.

If possible, stay home

If you live in a reliable building, stay in it, if you can, go to the upper floors, bring enough food, water and essentials. Take valuables and important documents with you.

If you did not anticipate a flood or the water is rising too fast, move them to higher levels of the house, such as niches, so that you do not have the opportunity to collect and carry valuables.

Keep in mind that floods can undermine the infrastructure of buildings and destroy weakened buildings. Always make sure your home is in perfect health.

Pay attention to the water level in your surroundings so that you can have an estimate of the water level rising and the rate of flood progress.

Use the water you have stored until you are sure of the health of the water sources or tap water.

If you want to leave home:

Have enough water, food and essentials with you.

Have enough clothes with you. Sometimes you may have to stay outdoors for a few days.



Ways to help against floods

If you anticipate that the water level will rise too high and endanger your life, think of a way to ask for help. Use high surfaces such as the upper floors, the edge of the roof and even the edges of windows and ask for help by shaking fabrics and shiny objects and certain colors and even shouting.

Avoid going to the middle of the roof if there is a severe storm or you may damage the roof.

Also, if your roof is sloping, avoid going to the roof as much as possible.

If you are outside:

Be very careful when crossing the water. Only a height of 15 cm with strong current is enough to upset your balance.

If possible, use a piece of wood to estimate the path around you and the underwater surface.

Avoid traffic near dams and dams.

Minimize contact with water remaining from the flood as the possibility of severe contamination is significant.

Flood return period (year)

Structural methods of flood management is a subset of flood management that includes the role of the structure and its operation. Many of these methods have a history of several thousand years.

For example, the Kafra Dam in Egypt was built 4,600 years ago to control floods, which was destroyed by floods. Structural methods are also referred to as flood control. Flood control includes special processes that eliminate or reduce the destructive effects of floods by providing and operating designed structures, which is done by storing, limiting and diverting flood flow to an economically justifiable extent. In many countries today, the safety of hundreds of millions of people against floods depends on dams, dams and flood diversions.

Best Regard

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