

## Flood is in the second rank among the natural disasters which threatens Turkey after earthquake.

Flood disasters in Turkey are ranked among “**higher economic losses events and most frequently encountered events issue**” in natural disasters.

229 people have lost their lives in 484 floods and overflows which have been experienced in 2000-2012 in Turkey, 308.894 hectares of land have been affected by floods Source: DSI.

The magnitude and frequency of floods in close relationship with climate change and environmental degradation, vary according to the region. In recent years, increased floods and overflows linked to the changes in the shape, frequency, intensity and amount of rainfall is visible especially in the area of the Black Sea.



Murat River



Rize- Çamlıhemşin - 2005



After 10 minutes ...

Preventing measures of sloppy land rehabilitation and gully erosion in upper parts of catchment that cause flood and overflow are being held by General Directorate of Combating Desertification and Erosion and General Directorate of Forestry, stream bed improvement is being held by General Directorate of Hydraulic Works



REPUBLIC OF TURKEY  
MINISTRY OF AGRICULTURE AND FORESTRY



GENERAL DIRECTORATE OF COMBATING DESERTIFICATION AND EROSION

## Evaluation of Turkey in terms of Flood Risk

Turkey has a high and a hilly topography and 57% of its total surface area is classified as mountainous. Average altitude is 1132 meters. In our country, sloppy lands which are more than 15% curve constitute 62% of the total area. The lands which altitude is higher than 1000 meters covers 56% of the country.

The structure characteristics like high and rough topography, excessive sensitiveness of soils to erosion, climate characteristics of semi-arid climate conditions give rise to severe torrential rainfalls and constitutes an ecologically sensitive structure to erosion and floods.

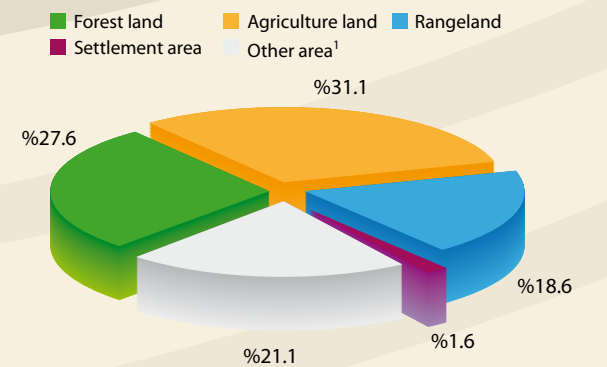
In Turkey in recent years, due to climate change, sudden and severe increase in maximum rainfall occurring at short intervals, and extreme climatic conditions and rainfalls are very frequent.

Mountainous and sloppy topography accelerate the movement of water. Especially rainfalls that fall to bare and sloppy lands cause flood and overflows by surface flow in a short time.

### FOREST ASSET:

Forests in Turkey cover 21,67 million hectares (%27,6 of country land). 99% of Turkey's forests belong to government. Approximately half of the forests is consisted of coniferous leaved and the other half is consisted of broad leaved species. **Forest land in Turkey has been increased approximately 1,47 million hectares of land with the works realized in 40 years.**

While mild zone mixed rain forests are located in the north, Mediterranean forest ecosystems are located in west and south regions, arid and semi-arid zone forest ecosystems in which steppe and oak species are found in Central, East and Southeast Anatolia, transition zone forest ecosystems expand in between coast and hinterland.



<sup>1</sup> Other land use covers forest clearance, rocky bare lands, settlement areas, artificial lands (industrial plants etc), areas covered by vegetation out of forest etc.



Ağrı - Doğubeyazıt



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## FLOOD CONTROL WORKS IN TURKEY



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# Combating with erosion is the effective way in combating with flood

With the “Upper Catchment Flood Control Action Plan” covering 2013-2017 prepared by Ministry of Agriculture and Forestry;

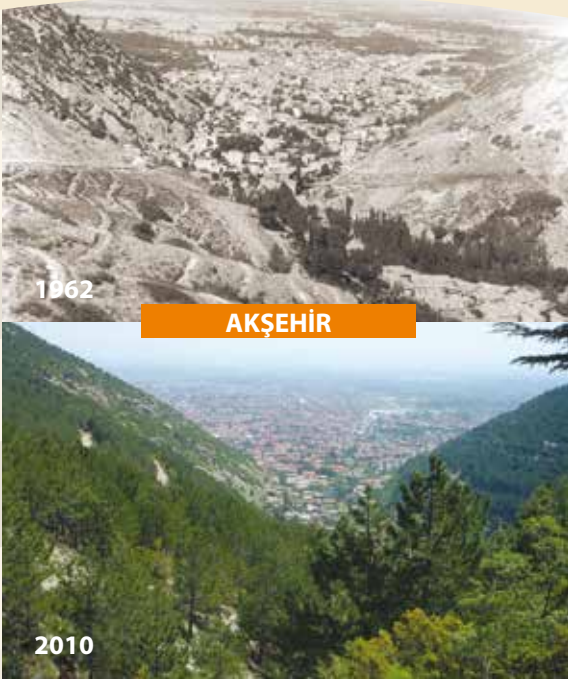
With the cooperation of General Directorates of ÇEM, OGM, DSI and according to the informations obtained from AFAD, Turkey's residential and agricultural areas where frequently recurring floods and overflows are experienced, are determined.

According to this, it has been decided to work on particularly 227 flood watersheds which are in our country's 25 main watersheds and it has been planned to work in 2.155.201,8 hectares of land in total.

For combating floods and flooding in the upper basins; the General Directorate Of Combating Desertification and Erosion realizes watershed based plans, flood model projects and implementation projects, while the Directorate General of Forest realizes the establishment and implementation application projects.

General Directorate of Hydraulic Works; is realizing dwarf walls, ground zones, rehabilitation check dams, precipitation check dams and flood traps. Dams and ponds which have big storage capacity for energy, potable water and irrigation will be constructed in order to prevent floods and overflows.

Early warning systems for floods and overflows realized in coordination with the General Direction of Meteorology, are used by ÇEM (General Directorate of Combating Desertification and Erosion Control), OGM (the General Directorate of Forestry), DSI (the General Directorate of Hydraulic Works) and MGM (the General Directorate of Meteorology).



## Flood Control Works in Upper Catchments



One of the most important reason of floods experienced in watersheds in Turkey, is the degradation of natural balance in watersheds especially with human factors, in addition to natural conditions degradation.

Particularly it is necessary to take measures preventing the runoff of rainfall on watersheds, and flood and torrent reducing measures.

This way, flood generation will be prevented or decreased at the beginning and this will be a security to facilities constructed/to be constructed in flood catchment.

### BEFORE - AFTER



Aydın

## Flood Control Works in Rangelands and Agricultural Lands

It is very important to take flood and erosion control measures in agricultural and pasture areas with high flood risk. It is necessary to implement looding control measures in such rangelands, in hillside lands and hollows, in order to stop erosion, to accumulate snow and rain waters, to prevent the runoff and to provide infiltration and drainage. Terraces are planned as in the size and spaces that will absorb rain generated by maximum rainfall.

In rangelands terraces, in order to provide livestock transition, truncated or staggered terraces are constructed, and drainage fences are constructed for evacuating, in every 5-6 terraces.

Implementation projects intended for flood control measures in the agricultural areas with more than 40% of slope are realized.



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## Upper catchment Flood Control Plantations

### Slope Stabilization Works

- Diversion ditches (diversion canals)
- Terraces
- Seeding in rills
- Wattle fences
- Gabion and geo synthetic fence
- Stone Cordon
- Stone Band

### Gully Rehabilitation Works

- Diversion ditches (diversion canals)
- Waste Ditches (water channels)
- Plants
  - a) Dry stone check dam
  - b) Mixed or bagged check dam
  - c) Bagged dike
  - d) Wire mesh and geosynthetics thresholds
  - e) Wooden check dam
  - f) Gabbion check dam
  - g) Biological plantations
    - Wattle living check dam
    - Brushed living check dam

### Course Rehabilitation Works

- Dwarf walls
- Ground Zones
- Rehabilitation Check dam
- Precipitation Dams (Storage Dams)
- Permeable and filter plants



Terraces formed by crawler excavator



Dry stone check dam



Ground Zones