

Water is the life ...

Türkiye



## Development of

# Dam Safety in Turkey

**TUNCER DINCERGOK**

Head of Dam Safety Branch  
General Directorate of State Hydraulic Works (DSİ)

2nd International Week on Risk Analysis as Applied to Dam Safety & Dam Security

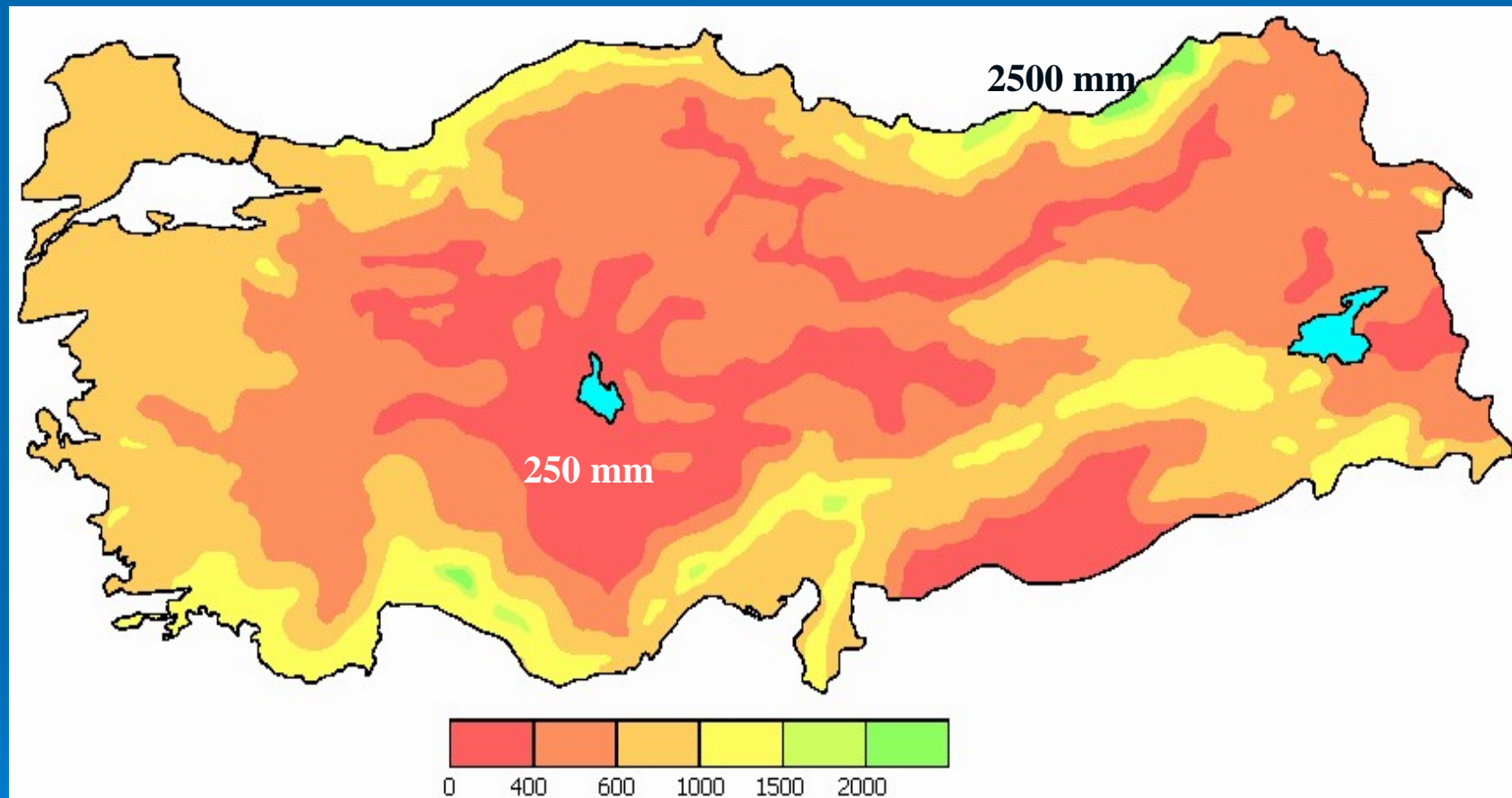
Valencia, Spain - February 26, 2008

# Turkey is located on the crossroads of Europe and Asia

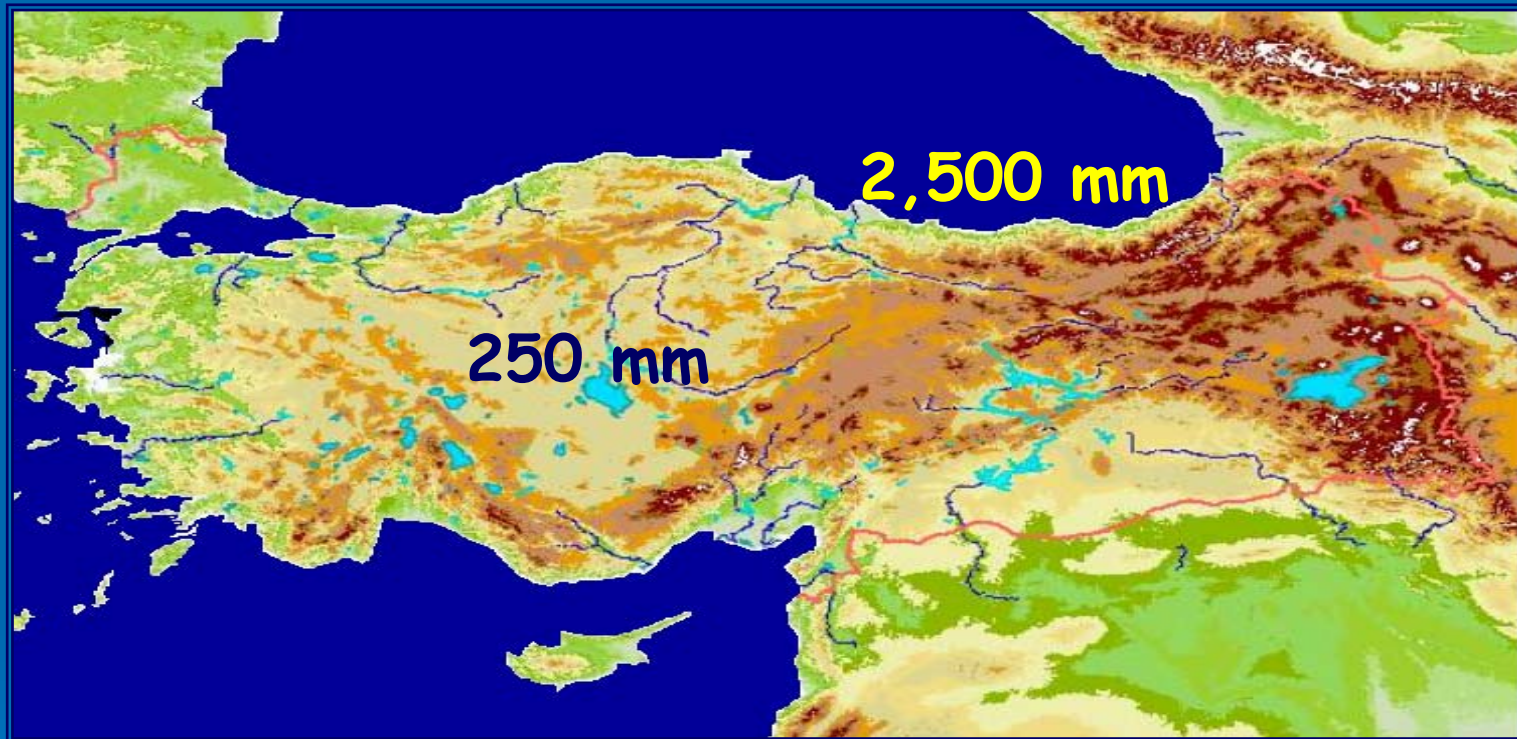




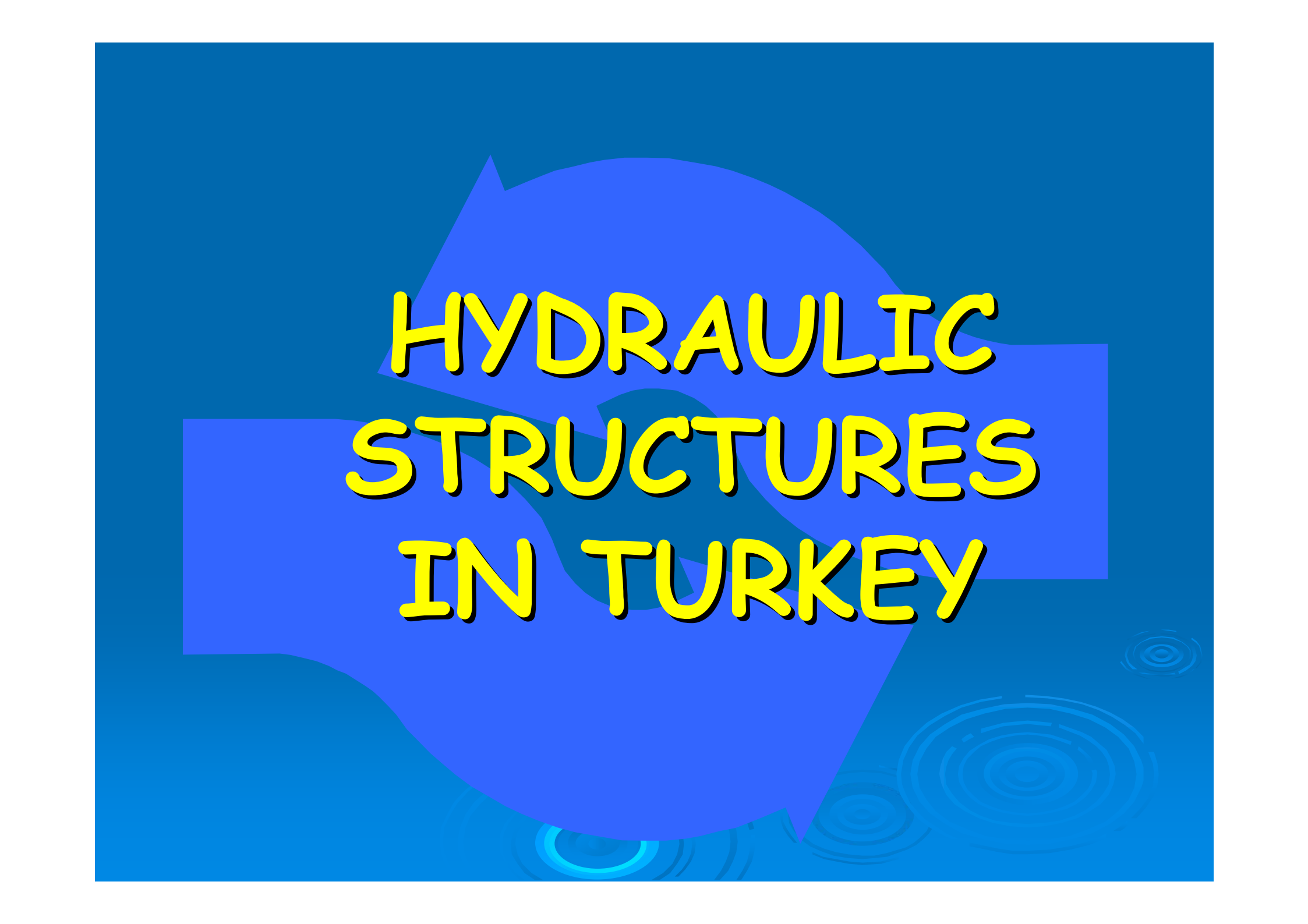
Turkey is located in a semi-arid region of the world



## Precipitation varies according to Season & Region



Rivers in Europe has more regular regimes than the rivers in Turkey.



# HYDRAULIC STRUCTURES IN TURKEY

# DAMS IN TURKEY (1950)

"THERE WERE A FEW DAMS..."



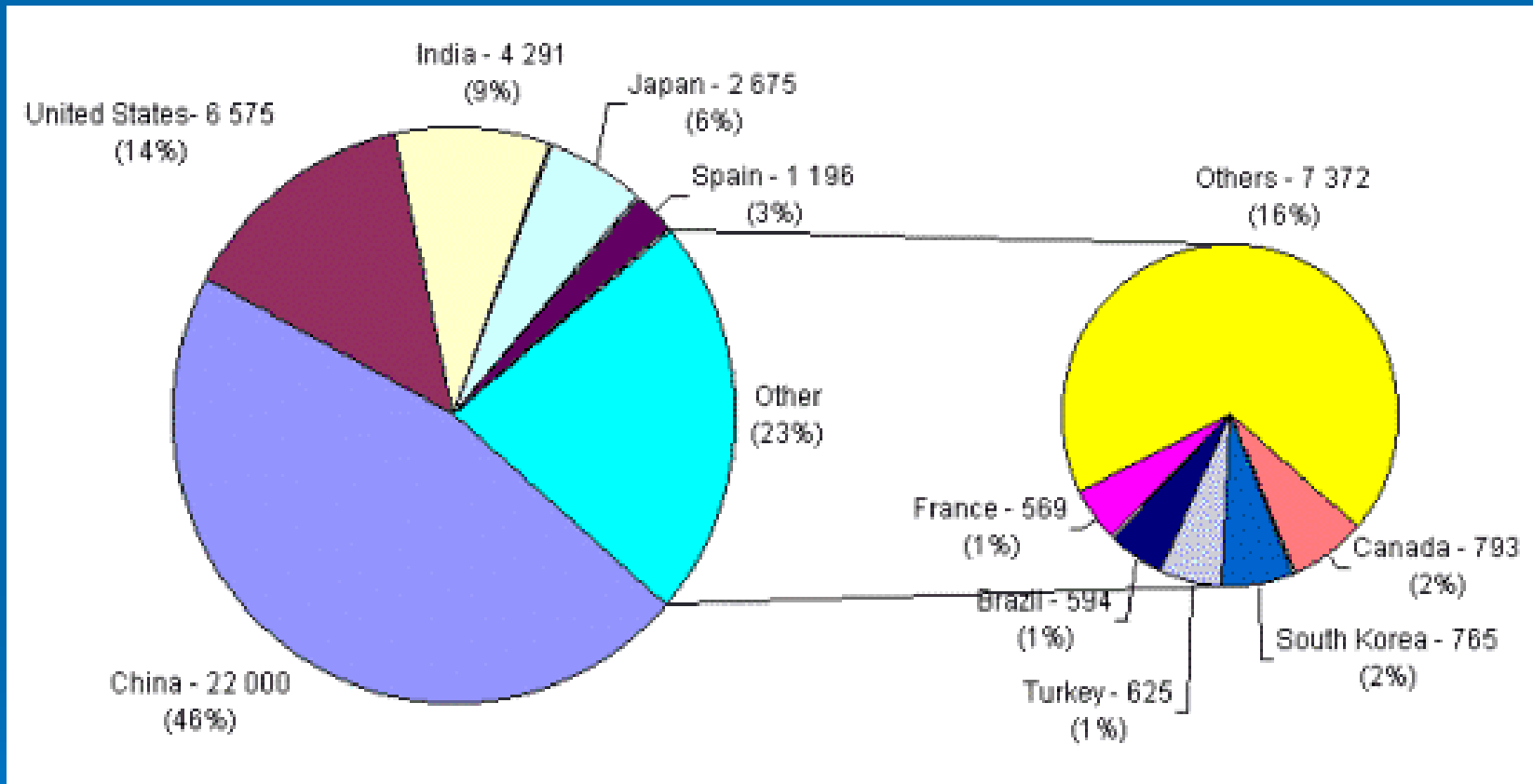


# DAMS IN TURKEY (2003)

*"... Turkey ranked in the 2nd & 3rd place in terms of the number of dams (H>60m & H>150m respectively) under construction in the world in 1999"*



# World Population of Dams



World population of Dams by country according to WCD estimates, based on ICOLD and other sources [WCD, 2000]



According to ICOLD standards,  
there are 591 large dams in Turkey as of January 2007.



Out of these 591 dams, 579 dams are built by DSI.

# General View of Dam Safety In Turkey



# GENERAL DIRECTORATE OF STATE HYDRAULIC WORKS (DSI)

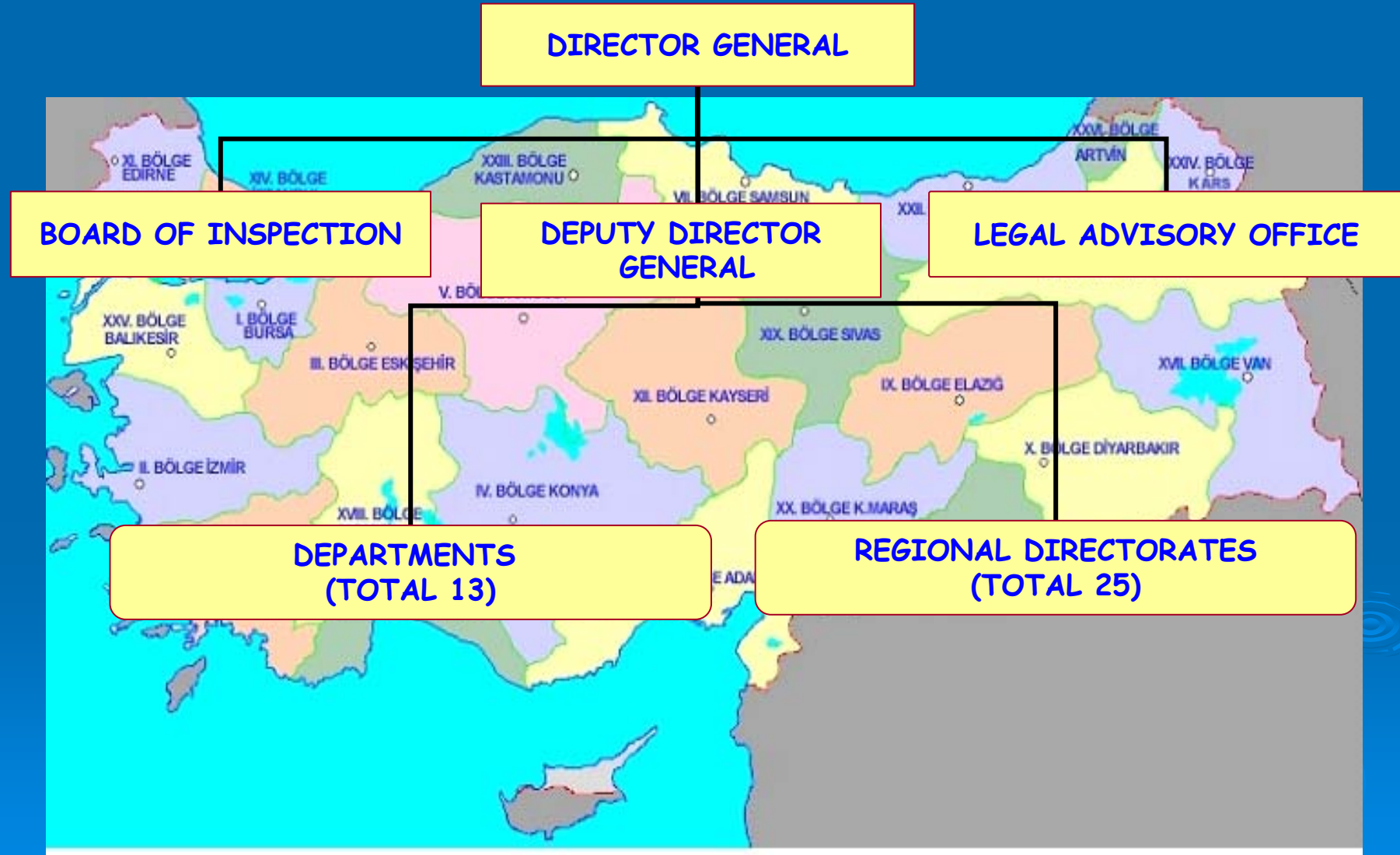
## MISSION:

The General Directorate of State Hydraulic Works is the main executive agency of Turkey responsible for the Nation's overall water resources planning, design, construction & development.

- ✓ DSI is a state organization established in 1954
- ✓ DSI is working under the Ministry of Environment and Forestry
- ✓ Invests ~ 2.5 billion USD each year which constitutes about 25 % of the national investment budget.



# ORGANIZATIONAL STRUCTURE OF DSI



# Planning - Design & Construction

- DSI applies its own standards such as
  - “Planning and Design Criteria for Large & Small Dams (1995)” and also
  - Design Directives (i.e Spillway Design )
- Accepts the universally accepted dam engineering design standards such as the procedures, codes and or standards of
  - US Bureau of Reclamation,
  - US Army Corps of Engineers,
  - DIN Standards,
  - ICOLD recommendations etc.
- Additionally, there are technical specifications for Dam Design, Concrete Works, Excavation and Filling Works, Geotechnical Investigations , Improvement & Consolidation of soil and Rocks, etc..

# Dam Monitoring

- Dams in Turkey are periodically monitored by using dam monitoring instruments installed during the construction phase. (Instrumentation Branch)
- Unfortunately, for some dams;
  - The number of relevant instruments are not adequate and
  - Some are not fully operational
- Dam body, slopes, foundation & grout curtain are checked regularly and the records are being compared with the design values.
  - Deformation
  - Displacement
  - Stress
  - Pore Pressure
  - Seepage
- Integration of catchment monitoring and dam monitoring systems as well as realization of early warning systems are on the agenda.



# Inspection

- Dams in Turkey are inspected on a yearly bases by the relevant unit of DSI
- Inspection Reports and
- General Dam Safety Evaluation Reports are prepared
- In case of a need for rehabilitation, the relevant cost is reported and suggested for the next year's fiscal program

# Operation & Maintenance

- Dams built for hydropower generation are handed over to EUAS (Electricity Generation Company) for operation in Turkey
- The Operating Curves are prepared and updated where deemed necessary by the relevant unit of DSI continuously
- Dams built and operated by the private sector are controlled to follow the OC as well

# Regulations

- Turkey has no specific legislation for dam safety yet, but the general requirements are identified in the following laws & regulations :
  - Protection against Flooding Law (1943)
  - Civil Defence Act (1958)
  - Measures and Assistance Regarding Natural Disasters affecting General Public Life Precautions for Natural Disasters Act (1959)
  - DSI Regulation on Protection against Flooding (1982)
  - The Environmental Law (1983)
  - Regulation on the Environmental Impact Assessment (2003)



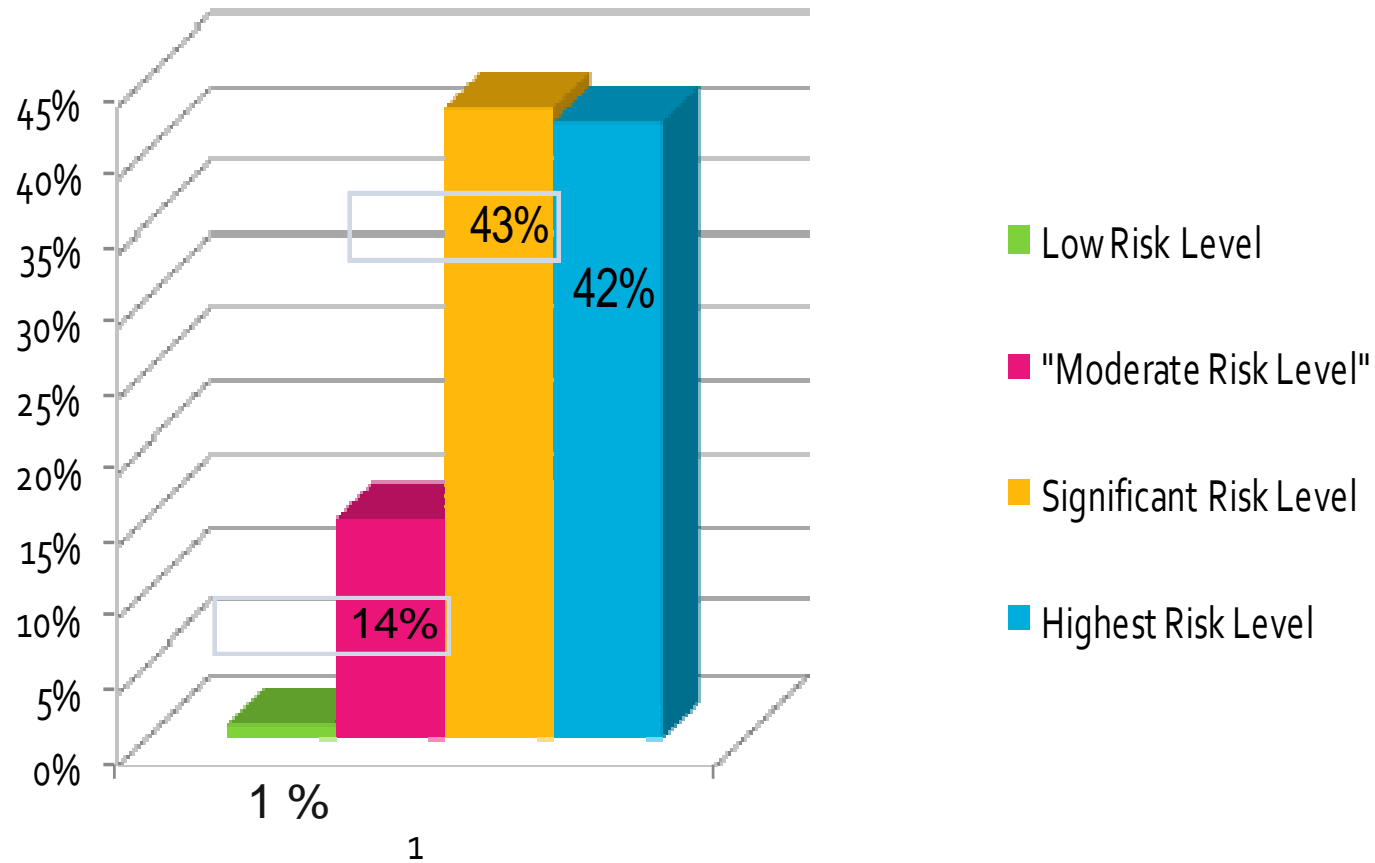
# Development of Dam Safety Concept In Turkey

# Dam Safety Studies (DSI)

- 1st Study - WG - General Directorate of State Hydraulic Works (DSI)
  - Dam Safety Working Programme - (1998)
- 2nd Study - WG - General Directorate of State Hydraulic Works (DSI)  
Regional Directorates of DSI
  - Risk Potential Classification Tables - (May 2002)
  - Inventory of Dams (In Operation & U/C)

## For Dams

- $H > 15$  m
- $5\text{m} < H < 15$  m with  $V = 3$  hm<sup>3</sup> or more, and
- Considered to have a high potential risk in terms of downstream conditions in case of a dam failure



Proportional distribution of Risk Levels  
for dams in operation and under construction in Turkey  
(As of May 2007)

Risk potential tables





# Dam Safety Studies (DSI)

- DSI Dam Safety Guidelines (Draft) - (January 2003)
  - ICOLD Dam Safety Guidelines and
  - Federal Guidelines for Dam Safety (FEMA - June 1979)
  
- DSI Dam Safety Branch - (Dec 8, 2005)



**DSI**  
**Dam Safety**  
**Branch**

# Purpose

- DSI Dam Safety Branch is established within body of the Dams and Hydroelectric Power Plants (HEPPs) Department at the General Directorate of State Hydraulic Works (DSI).
  - For :
    - Mitigating the potential risks caused by both natural and technical reasons and
    - Minimizing the damages and casualties to the downstream in case of a failure of a dam in operation.

# Responsibilities

Some of the major tasks and responsibilities of the Branch are :

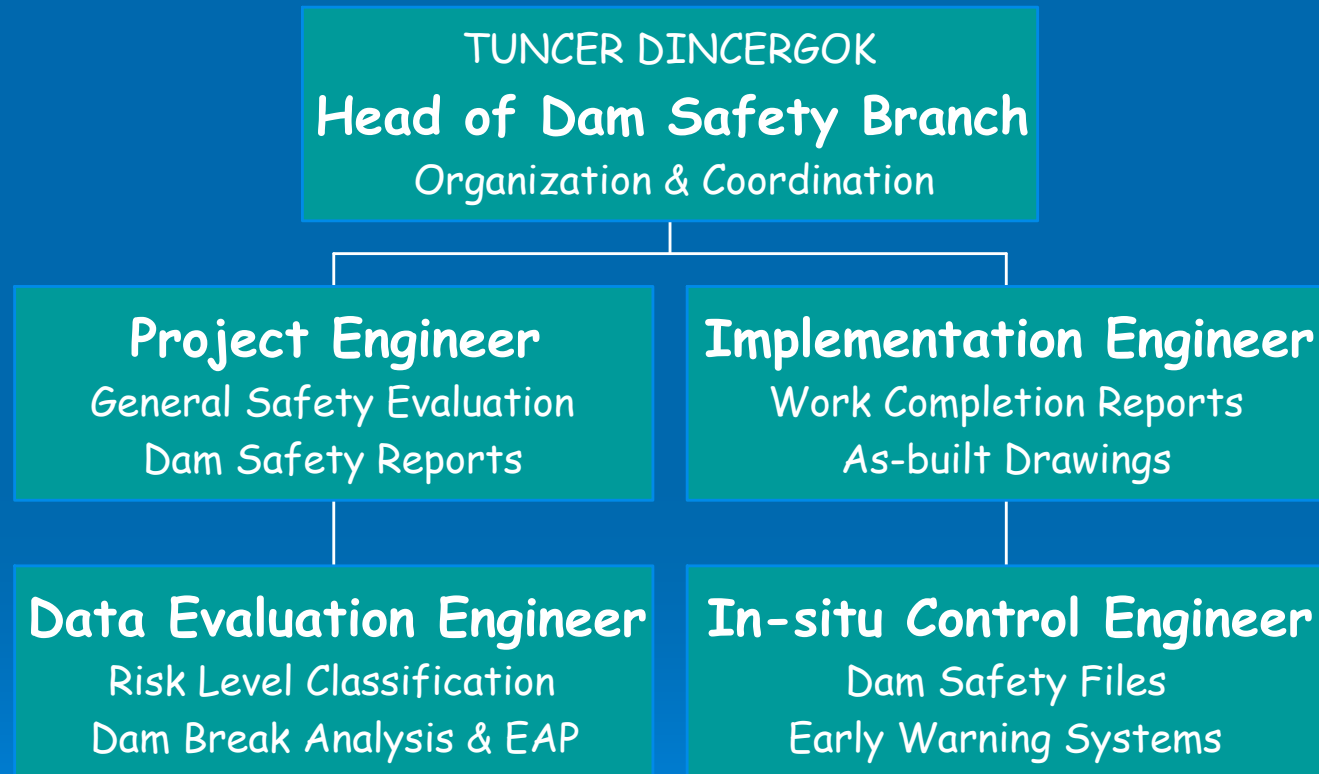
- Evaluation of Dam Break Analysis for different failure modes
- Preparation and Providing of
  - Work Completion Reports
  - As-built Drawings and Dam Safety Files
  - Dam Safety Reports
  - Inventory of Potential Risks of Dams in operation
  - Emergency Action Plans (Danger Zones, Response Levels, Inundation Maps)
  - Setting up Early Warning Systems



# Current Progress

- The activities of DSI Dam Safety Branch are initiated (August 7, 2006)
- The necessary documents regarding the inventory of dams in operation & under construction are prepared :
  - Dam Information Form
  - Updated Risk Potential Classification Table and
  - List of Risk Potential Table for the dams in operation
- Also, the organizational chart as well as the responsibilities of the Dam Safety Personnel are specified and the framework for the tasks of the Branch are identified

# Organizational Chart



# Ongoing Studies

- The process in order to form the extensions of DSI Dam Safety Branch within the body of DSI Regional Directorates is started and will be realized in 2008
- Finalization of DSI Dam Safety Guidelines
- The following forms and tables are being updated in order to re-evaluate the inventory of dams :
  - Dam Information Form
  - Updated Risk Potential Classification Table and
  - List of Risk Potential Table for the dams in operation

# Conclusions



# Conclusions

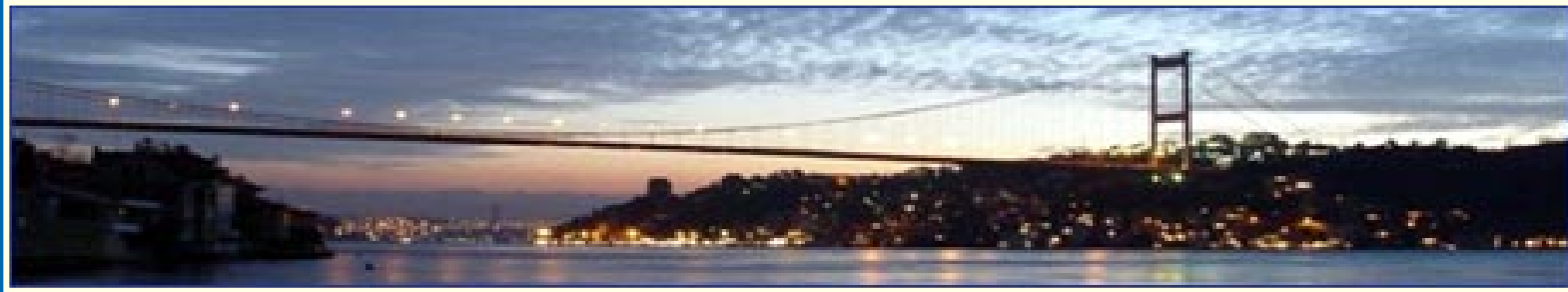
- Dams and HEPPs have overriding importance on the sustainable development of a country but in case of a failure great socio-economical and environmental impacts **resulting in fatalities and damages** may occur.
- Safety monitoring of dams should be maintained at all levels starting from planning through design, construction as well as operation; and checked by a **legal authority** in accordance with **legislations, regulations and safety guidelines**.
- **Turkey has not experienced any dam failures so far** but in order to organize and coordinate the relevant activities in a more efficient and effective way, **DSI Dam Safety Branch is formed** on December 2005 and started its activities on August 2006.
- As of Feb 2008, Turkey has **no specific legislation for dam safety**; but the general requirements are identified in the above mentioned laws and regulations.

# The Way Forward

- ✓ **DSI Dam Safety Guidelines** will be finalized and issued as an annex to the Civil Works Technical Specifications
- ✓ A directive / circular, specifying the necessary actions to be realized in accordance with the DSI Dam Safety Guidelines, will be issued by DSI
- ✓ **A budget**, necessary for the priority actions to be realized on relevant dams and HEPPs in accordance with the issued directive, **will be raised** and included in the related **DSI Investment Programmes**

# The Way Forward

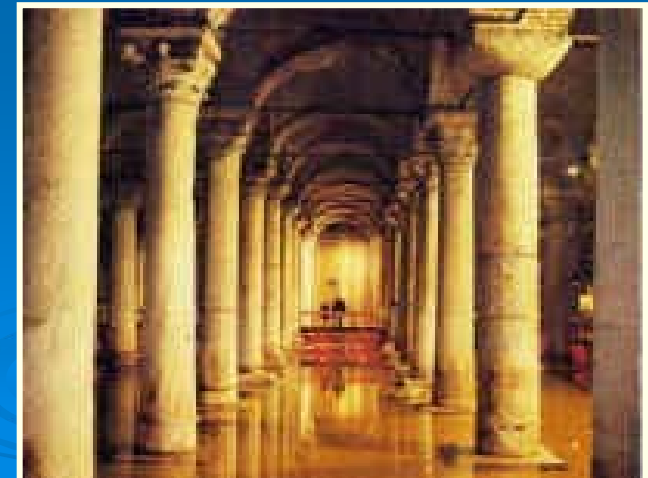
- ✓ In order to define the related tasks, responsibilities and regulations to be followed by all dam owners (including private sector, autoproducers and autoproducer groups as well as public); the **Dam Safety Legislation** will be enacted following its issuance in the Official Gazzetta and be related to the Energy Market Law no. 4628 as well as the relevant Electricity Market Licence Directive; so that the safety monitoring of these facilities should be maintained effectively on a regular basis.
- ✓ Legal regulations concerning the **tasks and responsibilities** of all the relevant organizations, especially the Local Administrations and Water User Associations will be prepared, in order to provide the coordination among **the related roles on dam safety**.
- ✓ Symposiums, seminars and workshops as well as meetings will be arranged in order to raise the nationwide awareness on dam safety.



# 5<sup>th</sup> World Water Forum

## Istanbul - TURKEY

### (March 2009)







5th WWF - Mexico City, March 20, 2006

"Peace at Home;  
Peace in the World!"  
Mustafa Kemal ATATURK





*Thank you for your  
kind attention!*

# For more Information



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