



Ministry of Interior
Disaster and Emergency Management Presidency

AFAD

“ The Long Road Ahead”

Earthquake Activity of Turkey

&

Earthquake Risk Reduction Studies

Dr. Murat NURLU

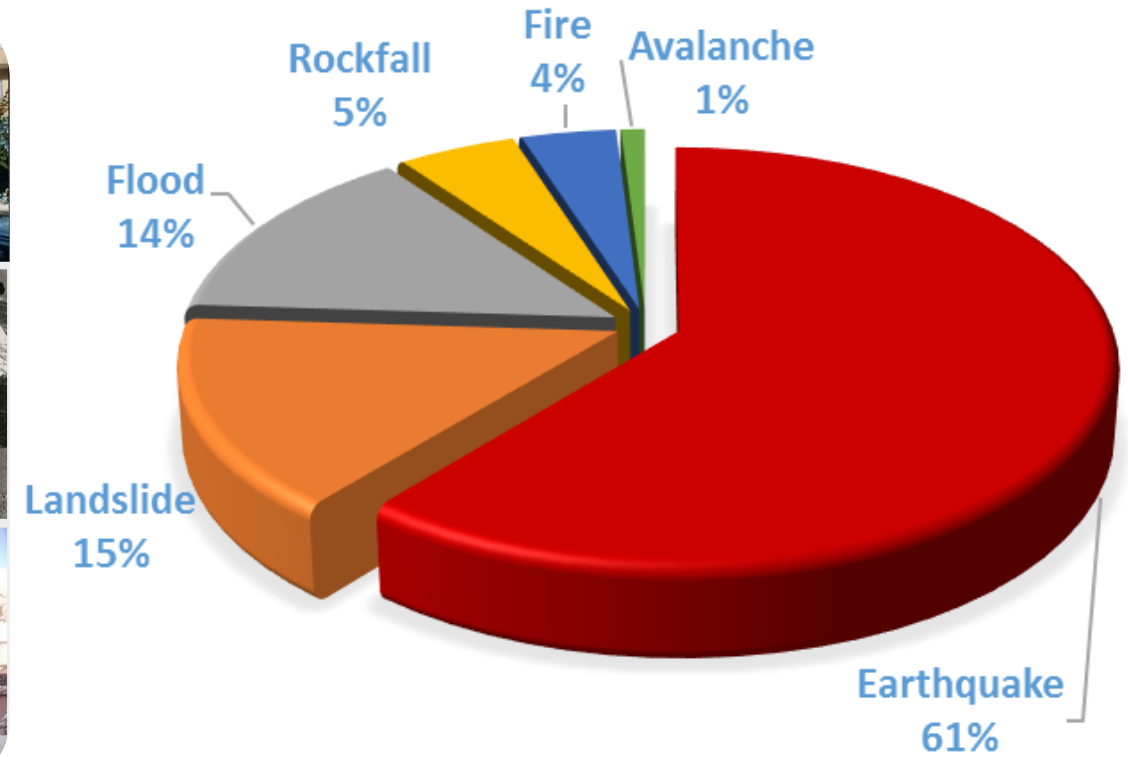
**Head, Earthquake Department, Disaster and Emergency Management
Presidency**

Content



- A Long Road Ahead. Why?
- Afad's Role in Disaster and Emergency Management in Turkey
- Earthquake Activity and Some Facts in Turkey
- Earthquake Risk Reduction Studies

The Long Road Ahead !



History of Earthquake Risk Management Governance and Research



Pre - 1939

Opening of the first university 1863	Establishment of the first observatory (Rasathane-i Amire) 1868	Begining of the first engineering education (Hendese-i Mülkiye) 1883	First scientific investigation of earthquake phenomena 1894 Earthquake	Establishment of first geological institute, University Reform 1933
Establishment of Mineral Research and Exploration Institute 1935				

1939-1965

1939 Erzincan Earthquake (Ms=7.9) 1942, 1943,1944,1957 Earthquakes	First Legislation on the measurements to be taken before and after earthquakes 1944	First Earthquake Hazard Map and Earthquake Resistant Construction Legislation 1945	Istanbul University Geophysical Institute Istanbul Technical University, Seismology Institute 1952	Establishment of Earthquake Bureau of Ministry of Public Works 1952
First contact with Japanese Scientists in Turkey 1952	Law on Public Works 1956 Establishment of Ministry of Public Works and Settlement, 1958	Establishment of Civil Protection Dept. and first civil protection law No:7126	Disaster Management Legislation N: 7269 1959	TUBİTAK 1963, Turkish National Committee of Earthquake Engineering, 1965

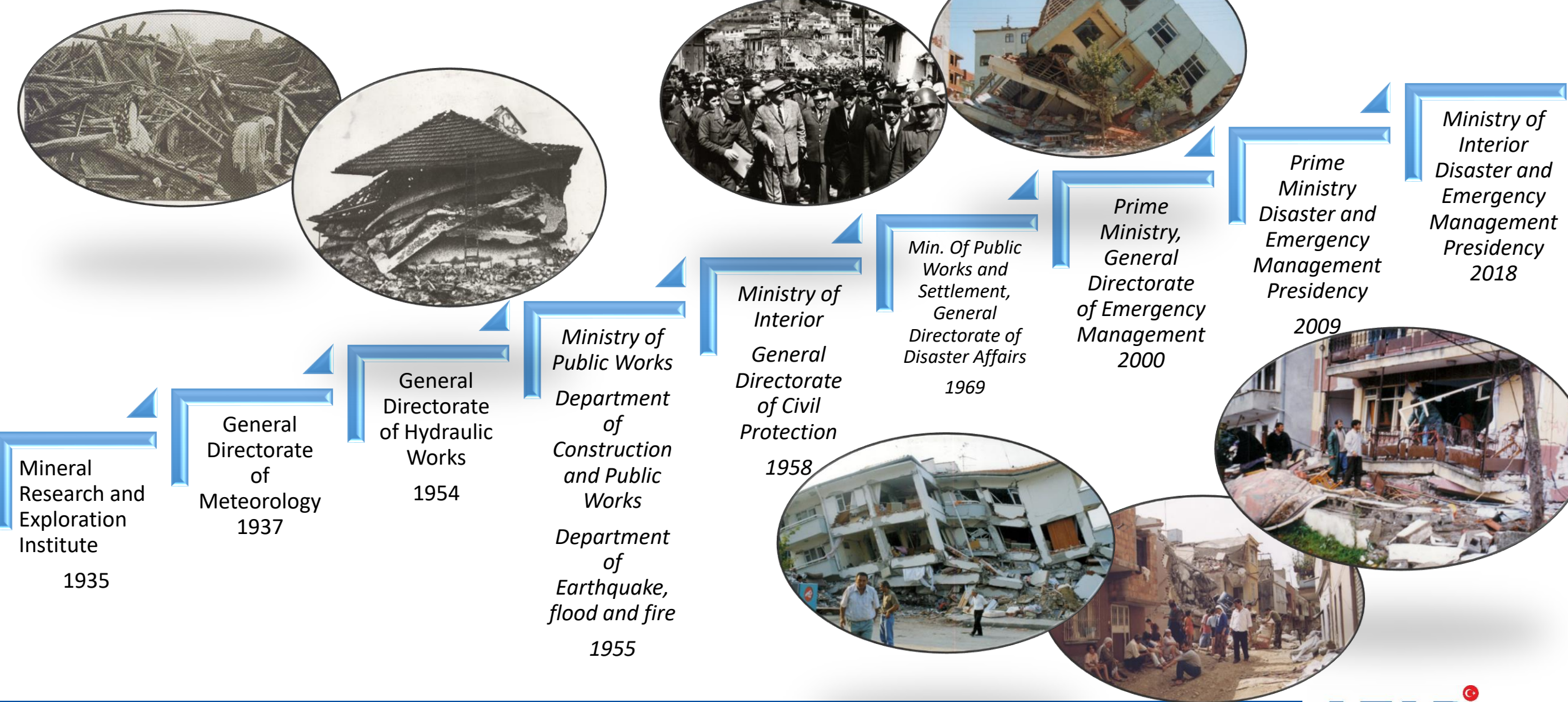
1965-2009

Establishment of Earthquake Research Institute under Min. Of Public Works and Settlement, 1971	Establishment of Earthquake Engineering Research Group , METU 1971	Standards for the design and construction of concrete, steel and masonry buildings 1974	Organisation of 5th European Conference of Earthquake Engineering in Istanbul 1975	Organisation of 7th European Conference of Earthquake Engineering in Istanbul 1980
1999 Marmara Earthquake (Ms=7.6)	Establishment of National Earthquake Council 2000	Assignment of Duties to local authorities on earthquake risk reduction by Law 2000	Organisation of the 1st Earthquake Council Meeting 2004	

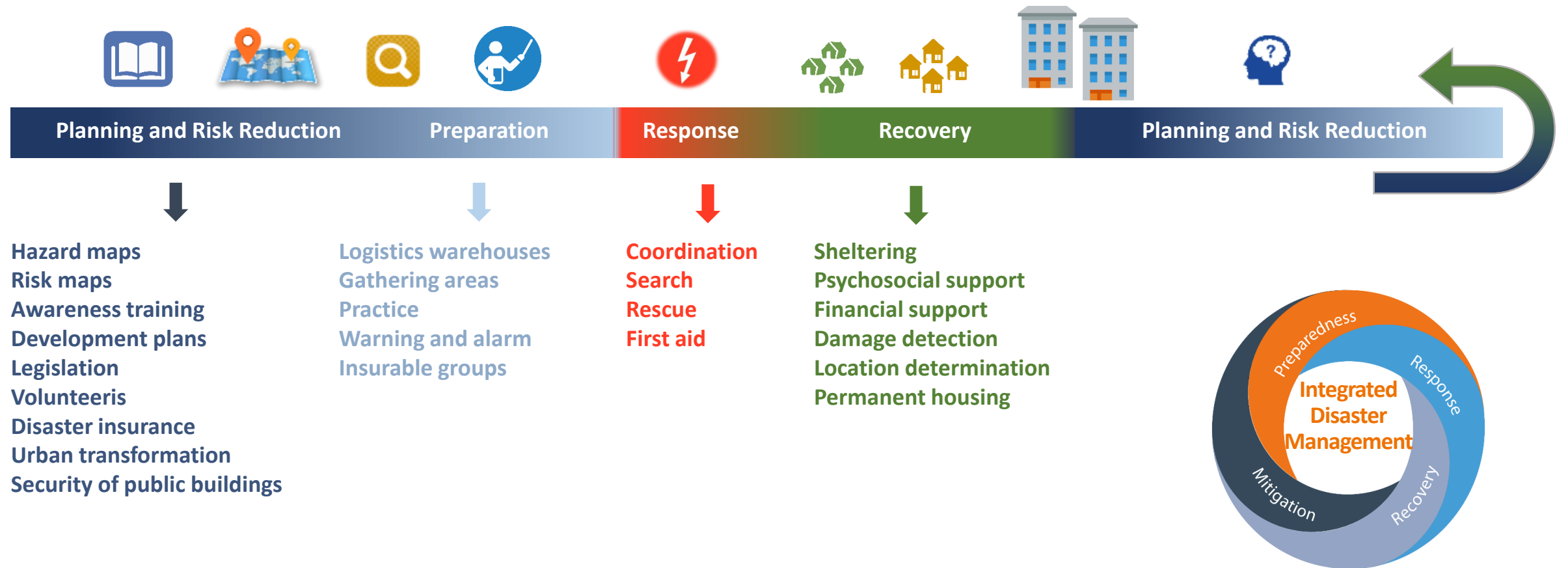
Post - 2009

Establishment of AFAD 2009	National Earthquake Strategy and Action Plan & National Disaster Response Plan	Revision of National Earthquake Hazard Map and Earthquake Resistant Construction Design Code	Significant Developments in Seismic Observation Capacity	Regional and Bilateral Cooperation on Seismic Observation
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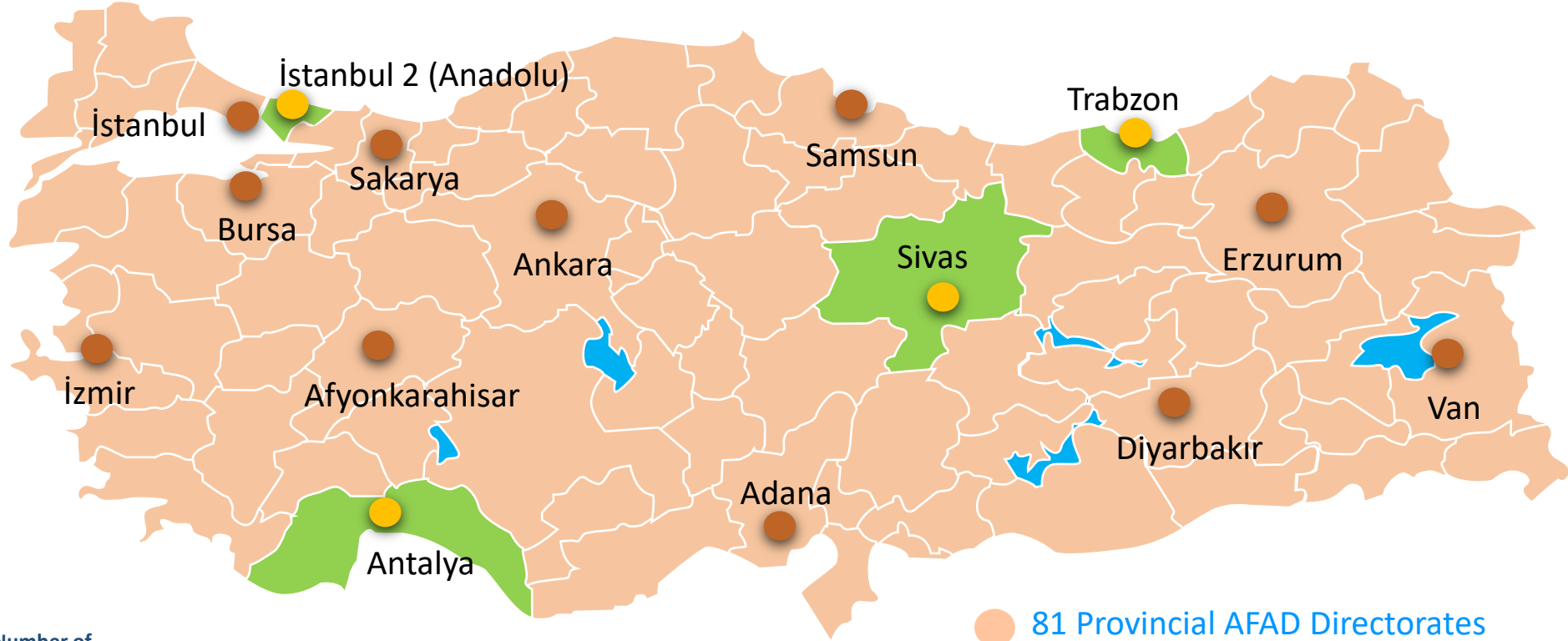
Organisational History of Disaster and Emergency Management



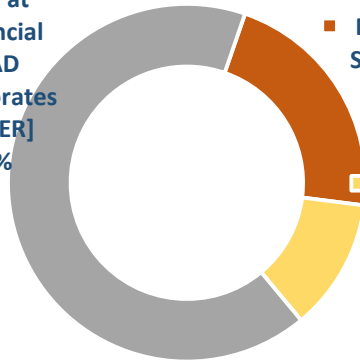
AFAD's Role in Disaster and Emergency Management



Provincial Organisational Structure and Human Resources of AFAD



■ Number of Staff at Provincial AFAD Directorates [DEĞER] 69%



■ Number of Staff at SAR Teams [DEĞER] [YÜZDE]

■ Number of Staff at AFAD Headquarters 506



Total Staff 5.337

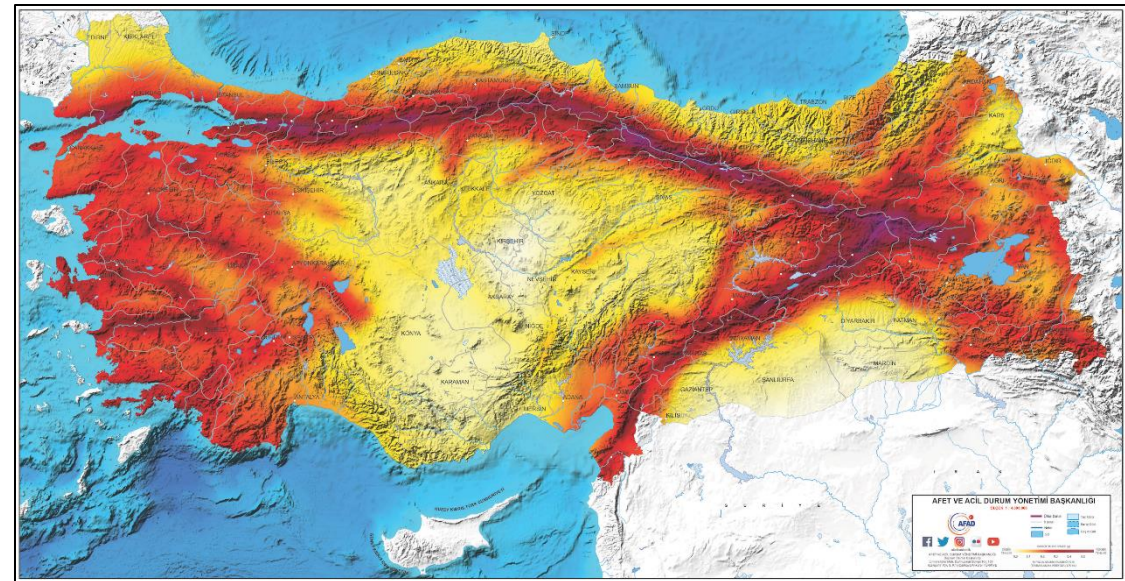
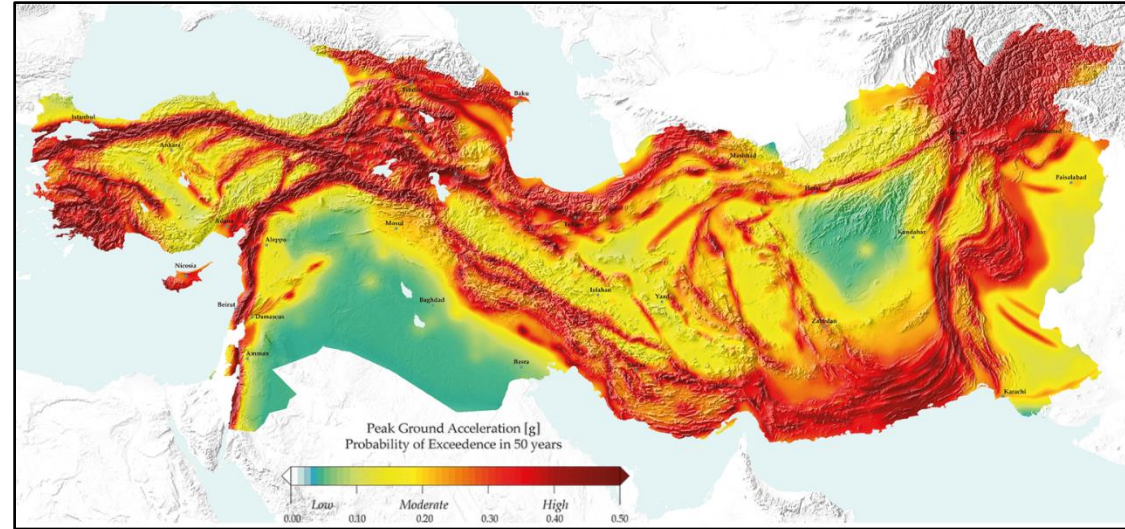
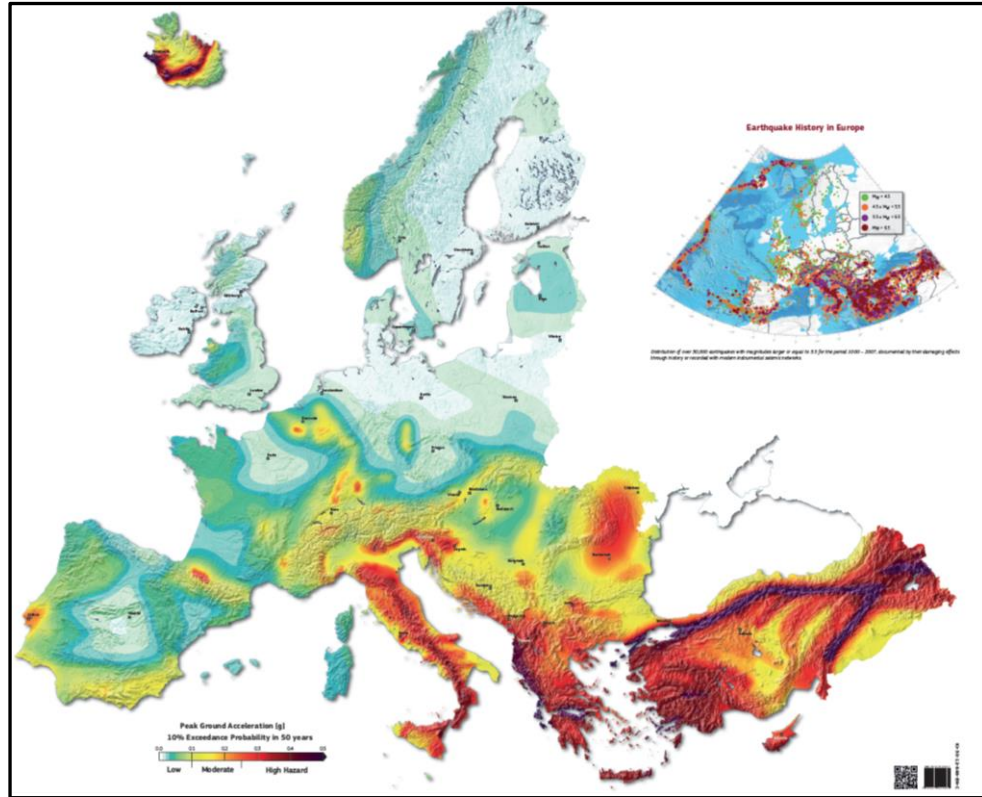
Total Permanent Workers 692

● 81 Provincial AFAD Directorates

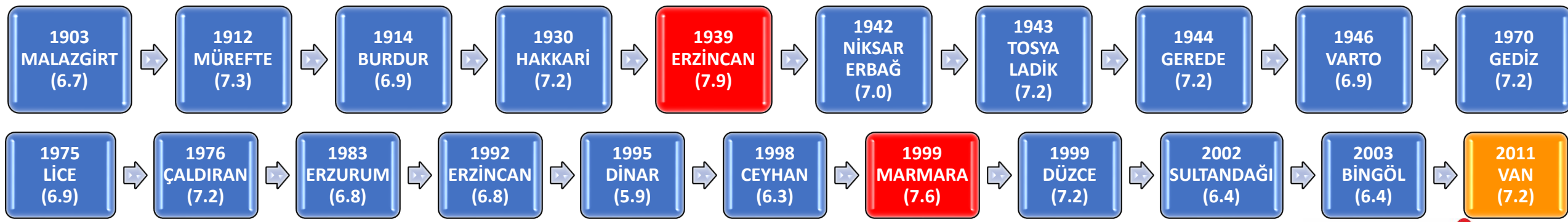
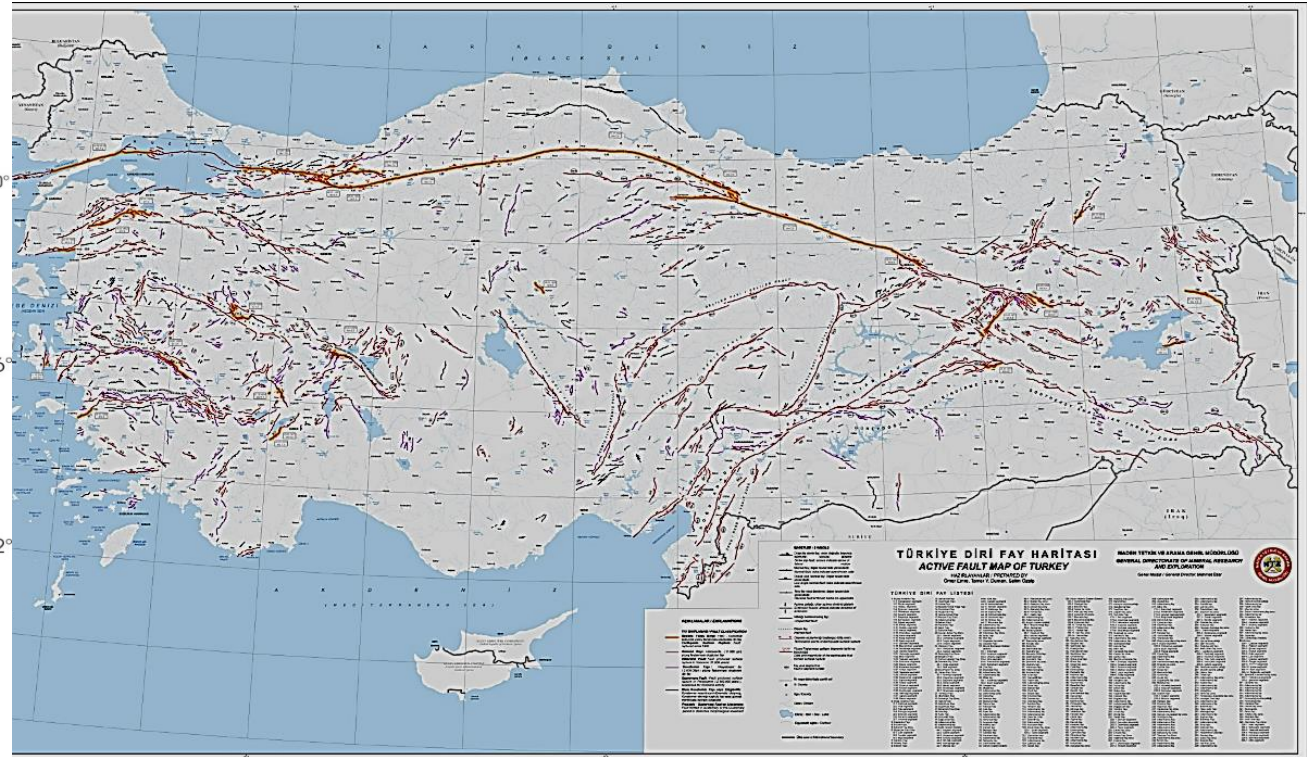
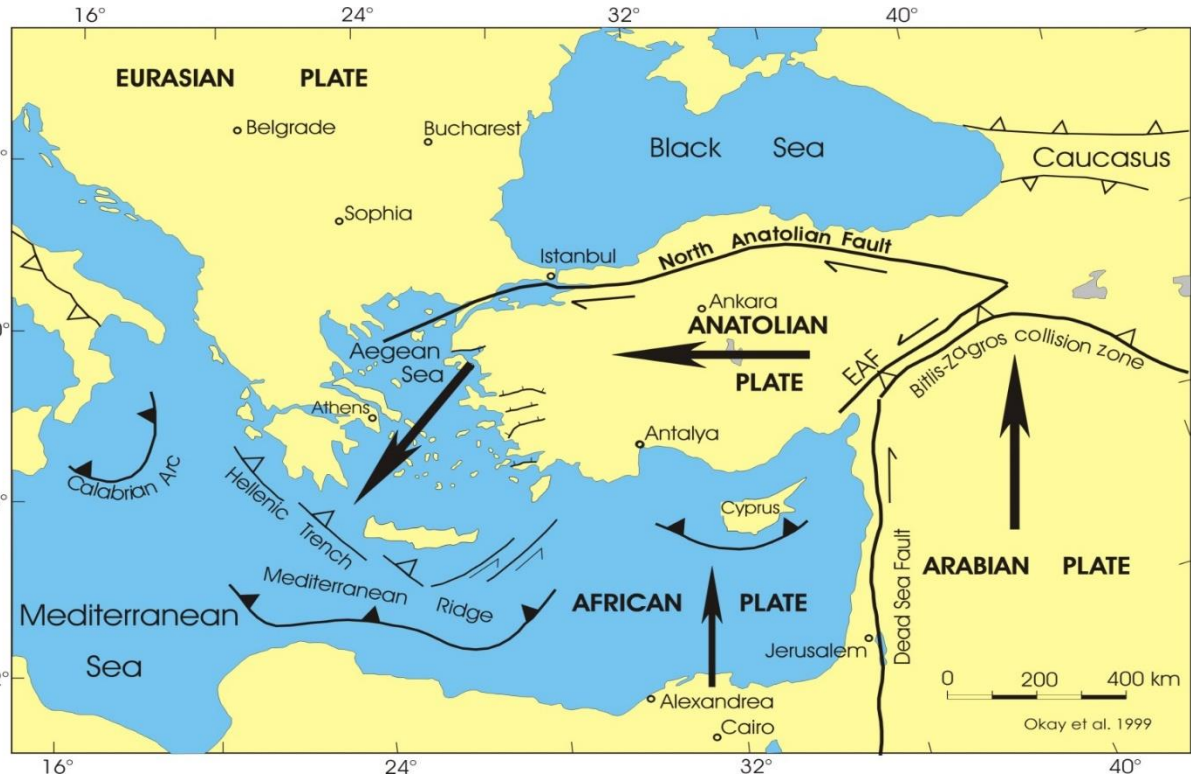
● 11 Search and Rescue Teams

● 4 Planned additional Search and Rescue Teams

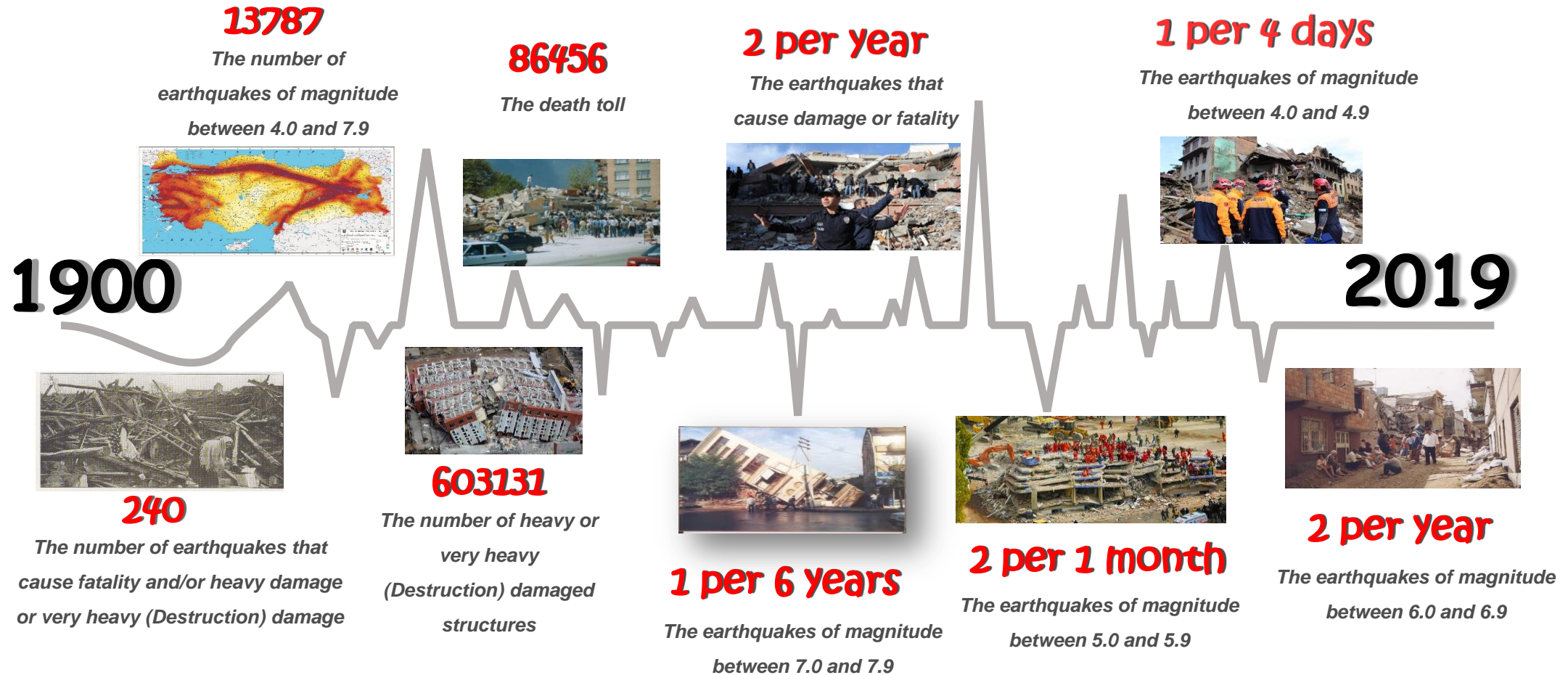
REGIONAL and NATIONAL EARTHQUAKE ACTIVITY



SIGNIFICANT EARTHQUAKES BETWEEN 1900-2019



EARTHQUAKE STATISTICS BETWEEN 1900-2019



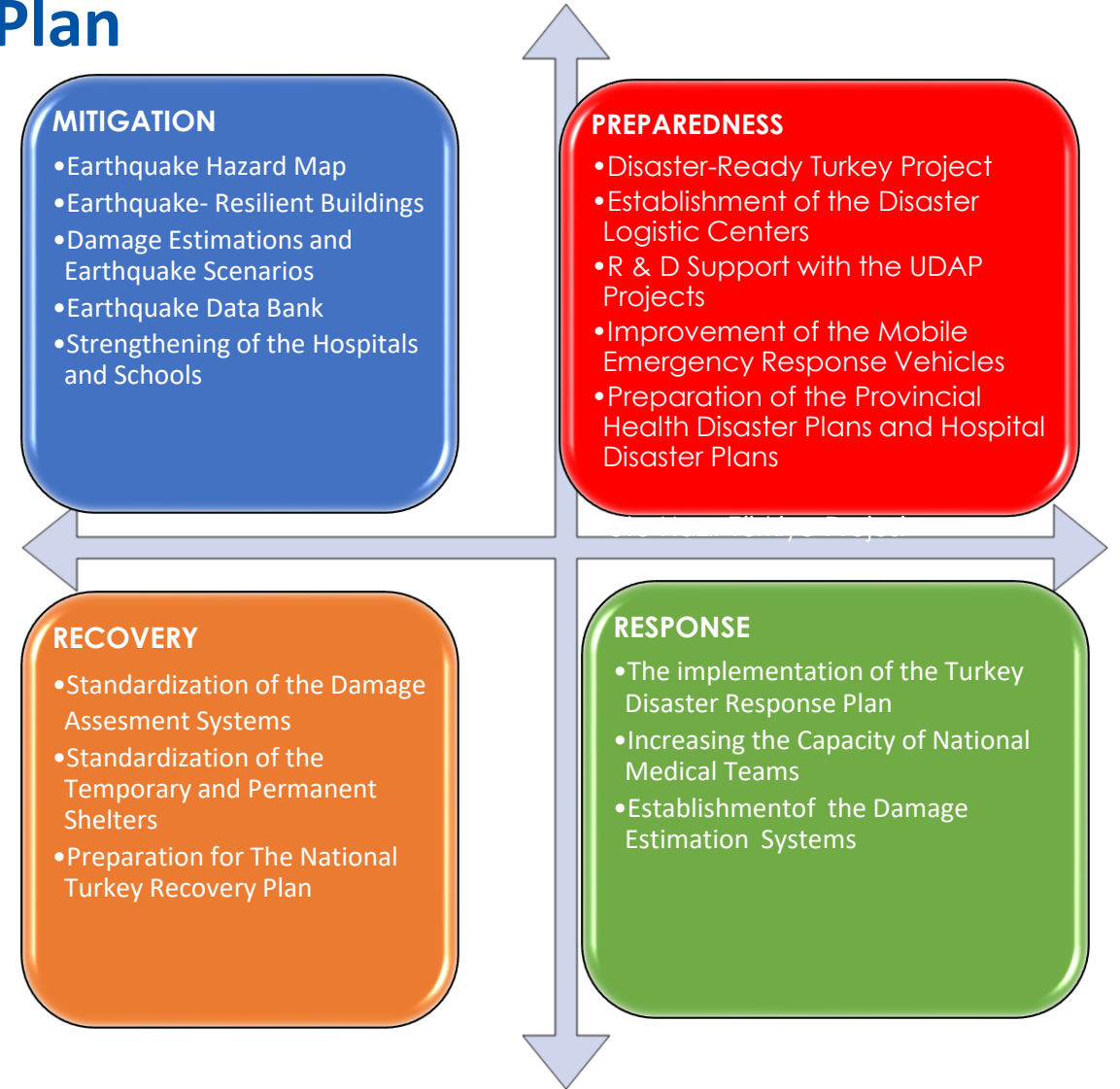
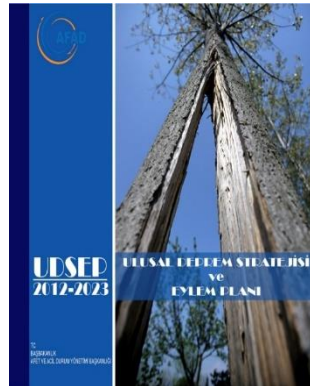
The statistical analyses are conducted by using the AFAD Earthquake Department and limited to the earthquakes of magnitude equal to 4.0 or greater.

EARTHQUAKE RISK REDUCTION STUDIES

National Earthquake Strategy and Action Plan

Disaster And Emergency Management Presidency	Ministry of Energy and Natural Resources	General Directorate of Mapping
Ministry Of Culture And Tourism	Ministry of National Education	Ministry of Development
Ministry of Environment and Urbanisation	Ministry of Treasury and Finance	Ministry of Interior
Ministry of Health	Council of Higher Education	Ministry of Transport and Infrastructure
Kandilli Observatory and Earthquake Research Institute		

The main objective of the National Earthquake Strategy and Action Plan is to prevent or mitigate the physical, economic, social, environmental and political harms and losses that may be caused by earthquakes and to create a safe, prepared and sustainable environment to protect from earthquakes.



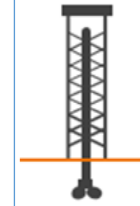
EARTHQUAKE RISK REDUCTION STUDIES



Earthquake Observation Network(Weak and Strong Ground Motion Observation Network)



Turkey Earthquake Data Center (AFAD-TDVMS)



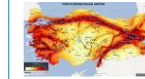
Borehole-Based Seismometer Network Project



Rapid Earthquake Damage and Loss Estimation System(AFAD-RED)



Specifications for Buildings to be Built in Seismic Zones



Seismic Hazard Map of Turkey



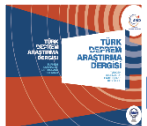
National Earthquake Research Programme (UDAP)



Global Navigation Satellite System for Earthquake Determination



Structural Health Monitoring System



The Turkish Journal of Earthquake Research



Developing the Earthquake Early Warning System for the High-Speed Rail and Natural Gas Distribution System

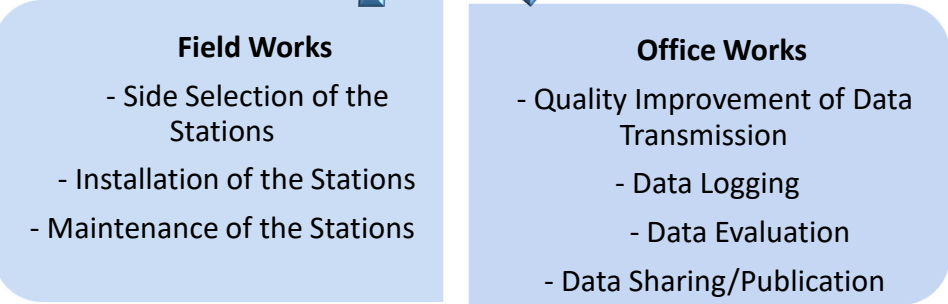
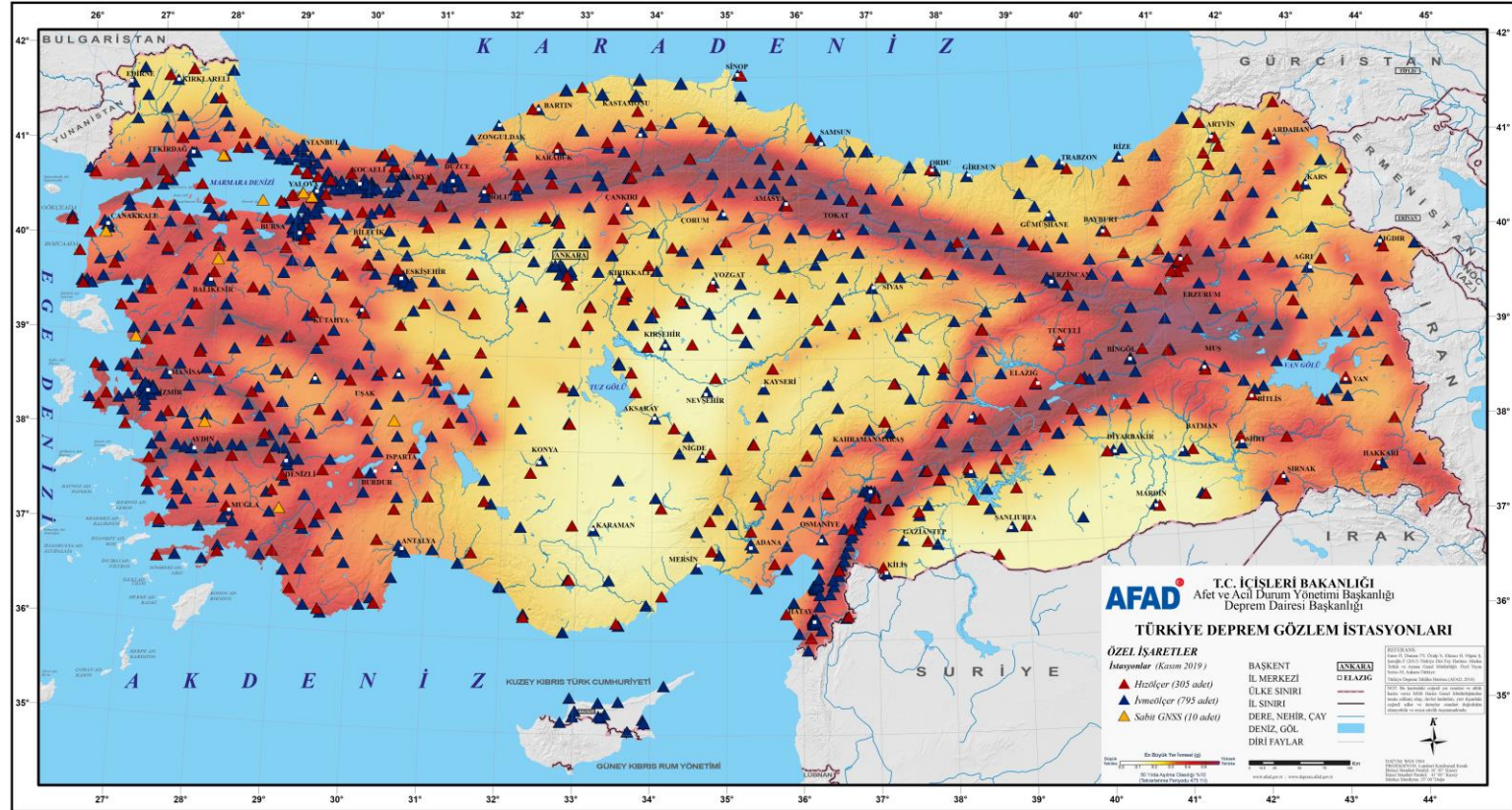


AFAD Earthquake Mobile Application

EARTHQUAKE RISK REDUCTION STUDIES



National Seismological Observation network

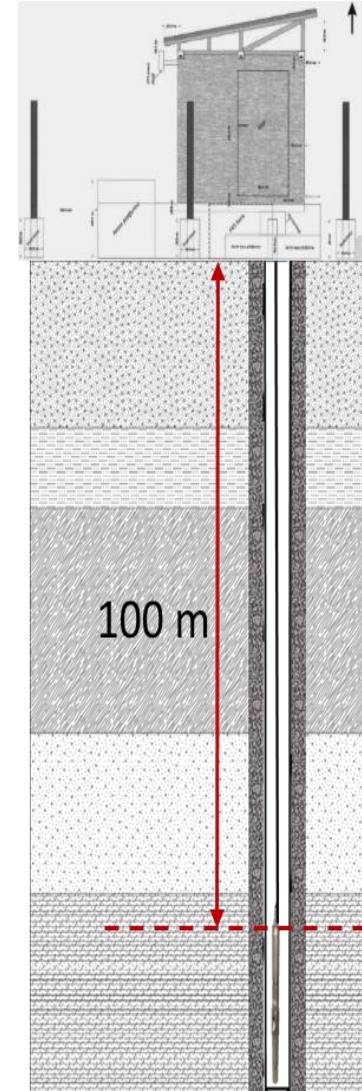
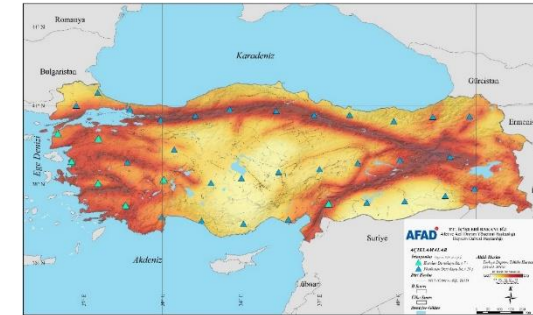


EARTHQUAKE RISK REDUCTION STUDIES

Borehole Seismometer Network Project



● GONAF Borehole Yerleri



EARTHQUAKE RISK REDUCTION STUDIES

Rapid Earthquake Damage and Loss Estimation System (AFAD-RED)

The main objective of the AFAD-RED;

The system supports the disaster management cycle (Mitigation, Preparedness, Response, and Recovery) following a disaster.

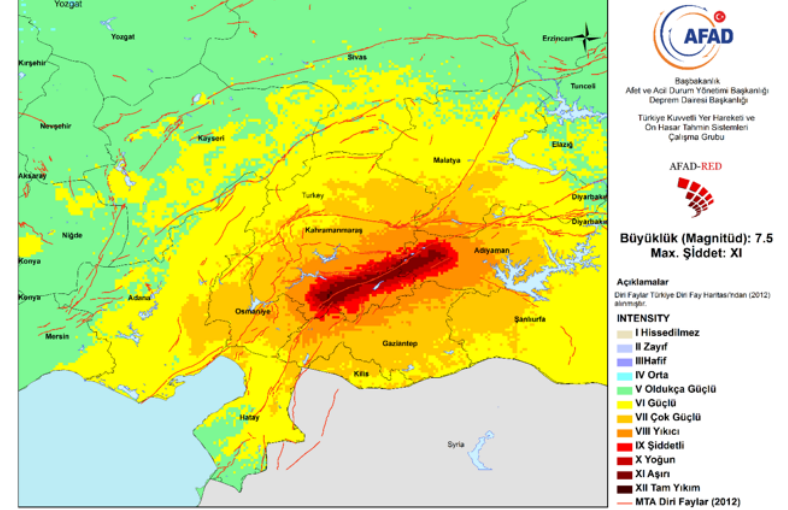
AFAD-RED

- The system provides automatic and manual solutions following an earthquake and estimates the damage and loss.
- Earthquake scenarios can be produced by AFAD-RED system ,
- The System is flexible,
- It is a integrated system with the earthquake observation stations and Disaster Management Decision Support System (AYDES),
- It is national software.



T.C. BAŞBAKANLIK
Afet ve Acil Durum Yönetimi Başkanlığı
Deprem Dairesi Başkanlığı

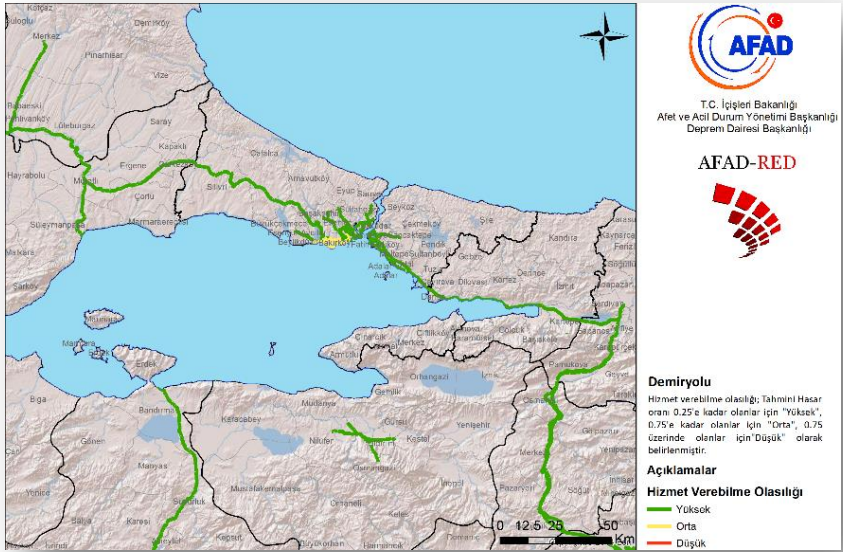
KAHRAMANMARAŞ DEPREM SENARYOSU



Tahmini Hasar ve Can Kaybı İstatistikleri (İl Bazında)

İl	Bina Sayısı	Az Hasarlı Bina	Orta Hasarlı Bina	Ağır Hasarlı Bina	Yıkık Bina	Etkilenen Toplam Nüfus	Ayakta Tedavi	Hafif Yaralı	Ağır Yaralı	Can Kaybı	Geçici Barınma (Kişi Sayısı)
Kahramanmaraş	213065	23558	24502	41902	40520	1087976	62195	23025	14883	7925	318459
Adıyaman	104028	13372	11846	13955	13086	572002	19796	7294	4731	2511	98779
Gaziantep	263175	41219	32125	21642	1652	1931836	5021	1848	728	371	84631
Osmaniye	126026	19011	14003	8372	445	520774	1049	363	125	58	18992
Malatya	113240	13002	7754	3780	219	695742	589	197	60	25	10655
Şanlıurfa	144672	14485	7824	3106	78	809680	327	96	15	3	7645
Adana	207963	18309	8695	2633	25	989825	262	67	3	0	5826
Elazığ	86	6	3	0	0	144	0	0	0	0	0
Hatay	88532	8910	4544	1479	15	398875	152	39	4	0	3446
Kayseri	1053	87	38	8	0	912	0	0	0	0	3
Sivas	286	23	10	3	0	777	0	0	0	0	3
Kilis	29906	3461	1934	718	2	130369	54	10	0	0	1562
TOPLAM	1292032	155443	113278	97598	56042	7138912	89445	32939	20549	10893	550001

EARTHQUAKE RISK REDUCTION STUDIES



AFAD RED System Ver 3.0.0 - Run Event/Scenario

Event Scenario Multiple Scenarios

Event/Scenario Name: 20190218163130_431394_4.0:Türkiye
YYYYMMDDHHMNSS_ID_MAG_(LOCATION)

Earthquake Parameters

Epicenter (Long. Lat): 44.2713 38.5730

Magnitude: 4 Moment

Fault Type: Unknown

Average Dip: 90

Rupture Width: 0

Rupture Depth: 11.25

Estimated Fault Length = 0.0870
<Mw= 4.0> <Ms= 2.2> <Ml= 4.2>

Generate Fault Coordinates

Fault Length: 0 Generate Coordinates

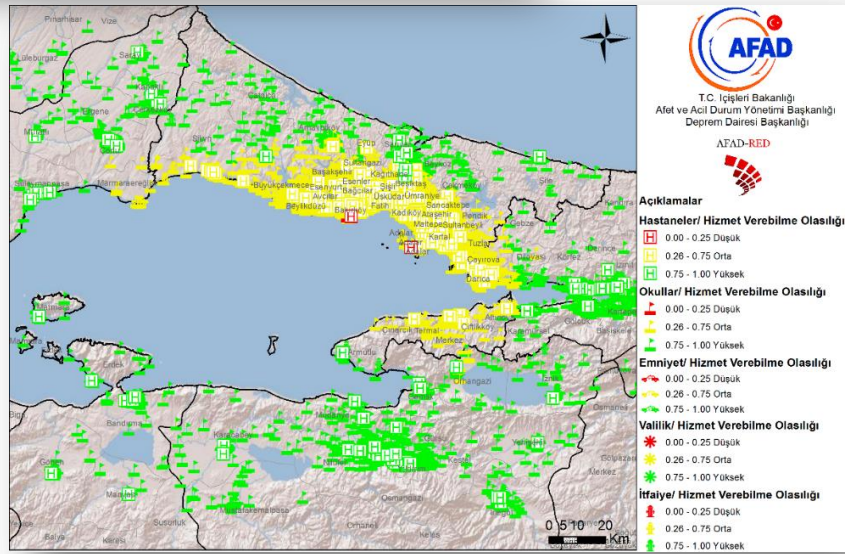
Azimuth: 0

Fault Coordinates

Longitude	Latitude
44.2713	38.5730

Computed Fault Length = 0.00

Event History List: 11/11



AFAD RED System Ver 3.2.0

File About

AFAD
T.C. İçişleri Bakanlığı
Afet ve Acil Durum Yönetimi Başkanlığı
Deprem Dairesi Başkanlığı

AFAD-RED V3

Operational Parameters

DataBase Parameters

Analyses Options

Post Processing & Reporting

Attenuation Relationship

Structures & Lifelines Vulnerabilities

EQ Stations Parameters

Event / Scenario Run

Online Event : 20190923070902_447679_4.0 --- Processed Successfully ---



The Earthquake regulations in Turkey were revised in 1947, 1953, 1961, 1968, 1975, 1998, 2007. 2018 «Specifications for Buildings to be Built in Seismic Zones» that came into force on January 1, 2019, is the last revision.

In the new regulation, the earthquake zone and the soil characteristics of the structure were taken into account for the minimum conditions which are necessary for the earthquake resistant design and construction of the structures. In the process of preparing the Earthquake Regulation,

8 workshops were held and The Regulation Preparation Commission and the members of the sub-working group of 110 people had made contributions and It was promulgated on March 18, 2018.

Why is the «Specifications for Buildings» updated?

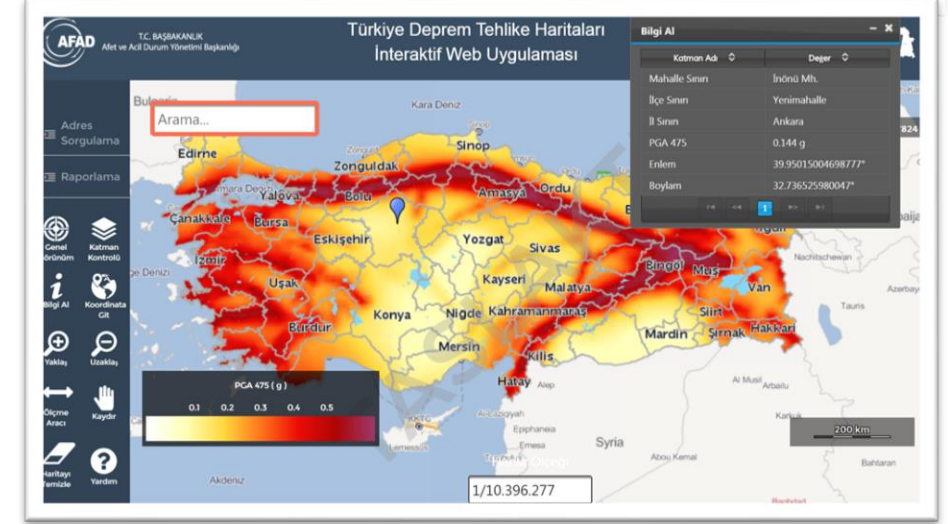
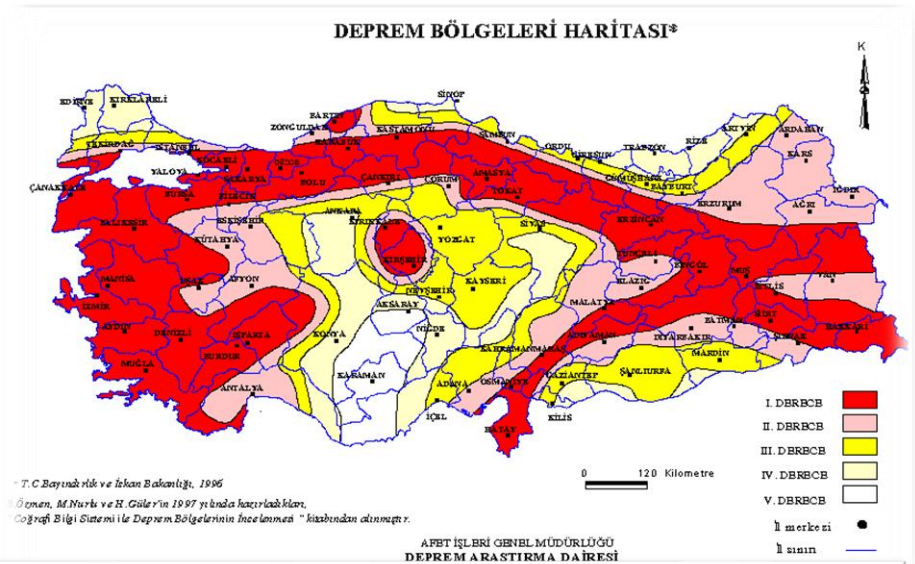
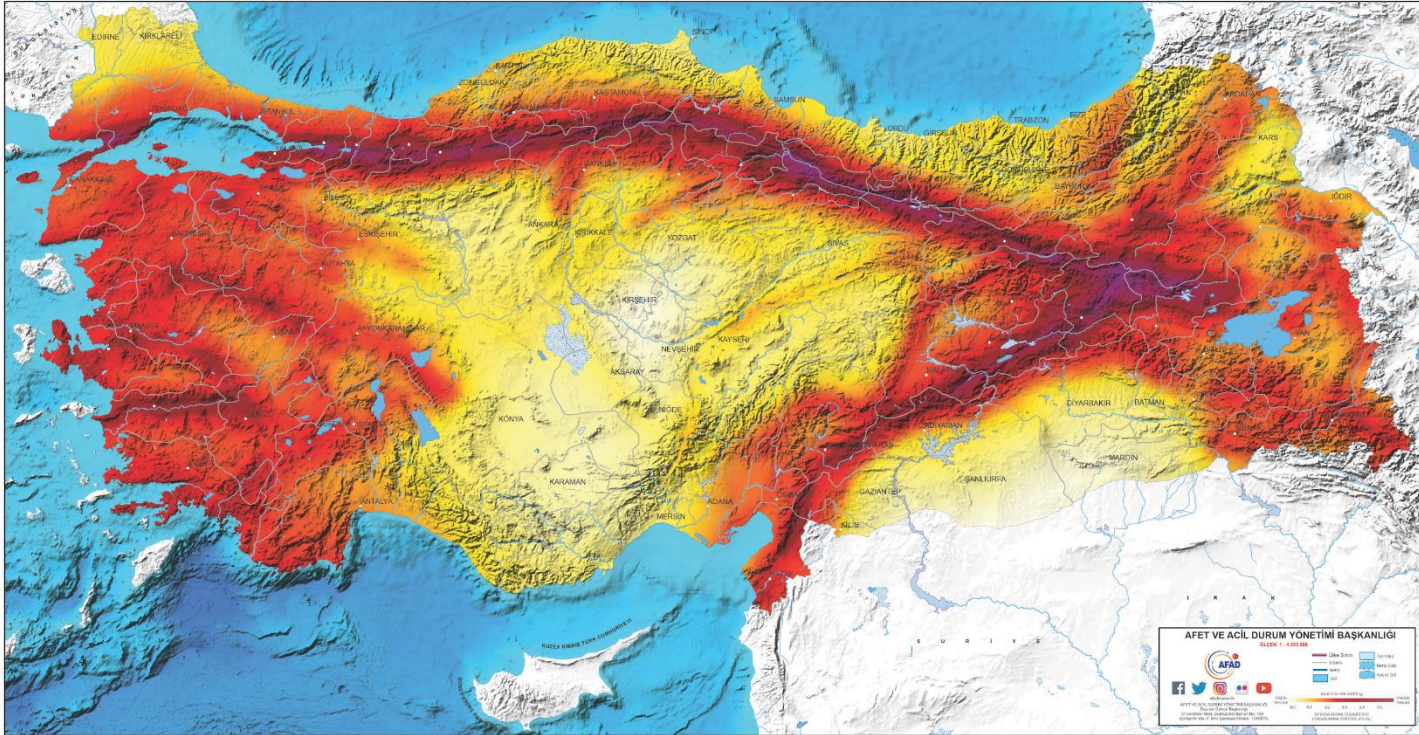
- The inevitability of being revised in line with the need the developing information and technology, the increase of the material diversity and the building models used,
- The fact that an important part of the existing building stock is insufficient in earthquake resistance,
- Within the context of Urban Transformation and structural risk reduction studies, evaluation and strengthening.

EARTHQUAKE RISK REDUCTION STUDIES

Seismic Hazard Map of Turkey

The Project was funded by AFAD, the National Earthquake Research Fund and the Natural Disaster Insurance Institution (DASK) has also given its support.

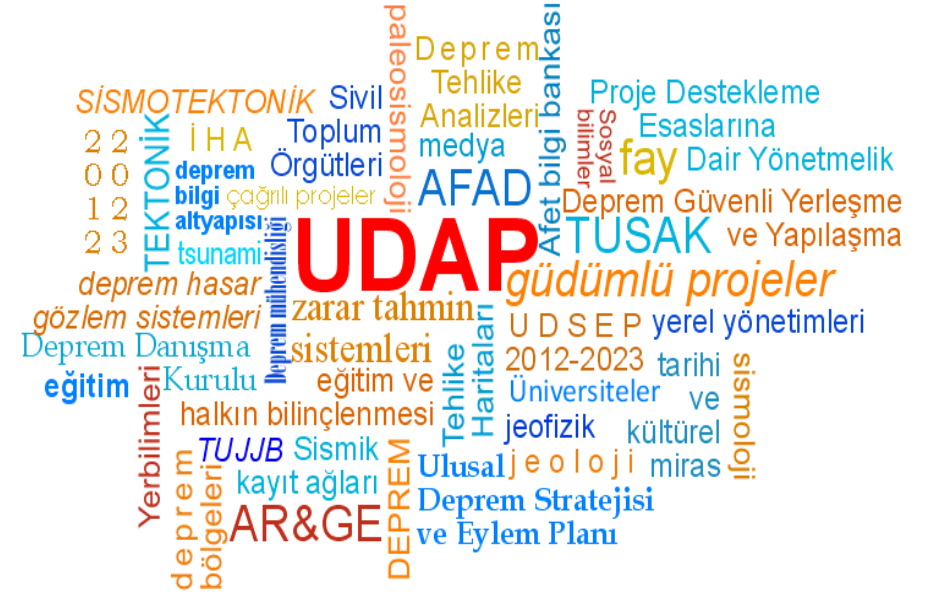
Seismic Hazard Map of Turkey came into force simultaneously with the "Specifications for Buildings".



EARTHQUAKE RISK REDUCTION STUDIES

National Earthquake Research Programme (UDAP)

- With the legislation dated April 27, 2012, National Earthquake Research Programme (UDAP) was established. **UDAP aims to support the scientific researches of geological, geophysical and earthquake engineering disciplines in order to create new technologies and enhance the earthquake studies.**
- Between **2012 and 2019, 44 projects in total (17 Invited and 27 Guided)** supported and the total allowance is **1.7 Million USD.**



	GUIDED PROJECTS	INVITED PROJECTS
MAXIMUM DURATION	2 YEARS	2 YEARS
MAXIMUM FUNDING	120.000 USD	60.000 USD

EARTHQUAKE RISK REDUCTION STUDIES

Innovative Project

Talk of the town
How smart structures work

KEY: Central computers, Wireless sensors, Sensor nodes, Wireless signals

SMART BUILDING

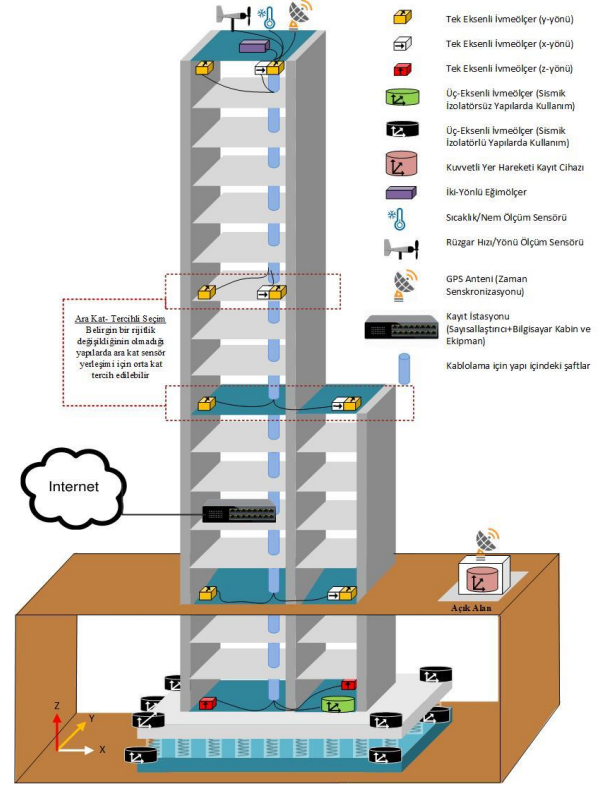
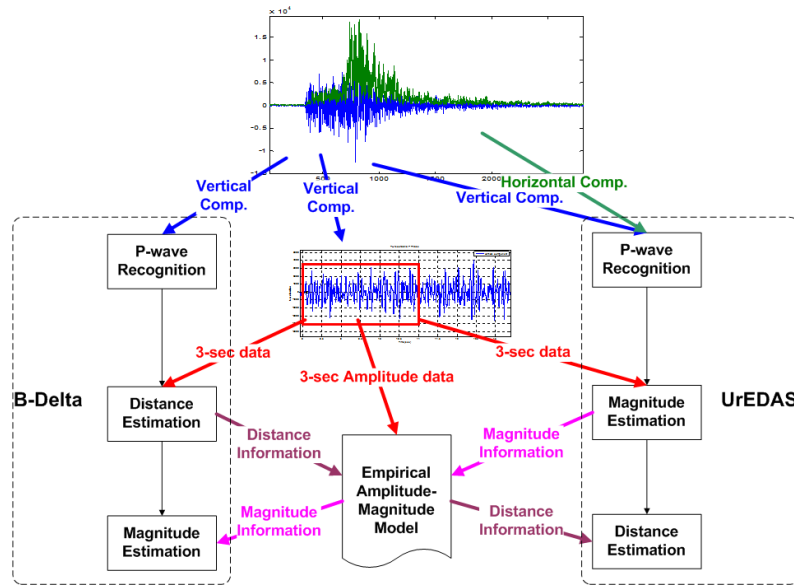
- Sensors in a building monitor the building's movement in response to strong winds or earthquake tremors.
- Shock absorbers (hydraulic dampers) can then be made to stiffen or relax and heavy weights (mass dampers) can be moved to reduce oscillations in strong winds, or minimise damage in the event of an earthquake.
- Buildings that detect an earthquake tremor could even warn other buildings nearby of the approach of a shockwave, so they could sound an alarm and prepare themselves accordingly.

SMART BRIDGE

- Wireless sensors mounted on the bridge monitor vibrations, displacement and temperature. This information then "hops" across the network of sensor nodes to a central computer for analysis.
- If a problem is detected, such as a loose bolt or cable, or the beginning of a crack, a warning can be sent by SMS.

SMART TUNNEL

- Wireless sensors mounted on the walls of a tunnel monitor displacement, temperature and humidity. This information then "hops" across the network of sensor nodes to a central computer for analysis.
- If a problem with the tunnel lining is detected, appropriate maintenance can be carried out. In future, a smart tunnel could even use robots to perform some maintenance tasks automatically.





Thank you for your kind attention