

Impacts of climate change *on* *Turkey's water resources*

Prof. Dr. Nüket SIVRI

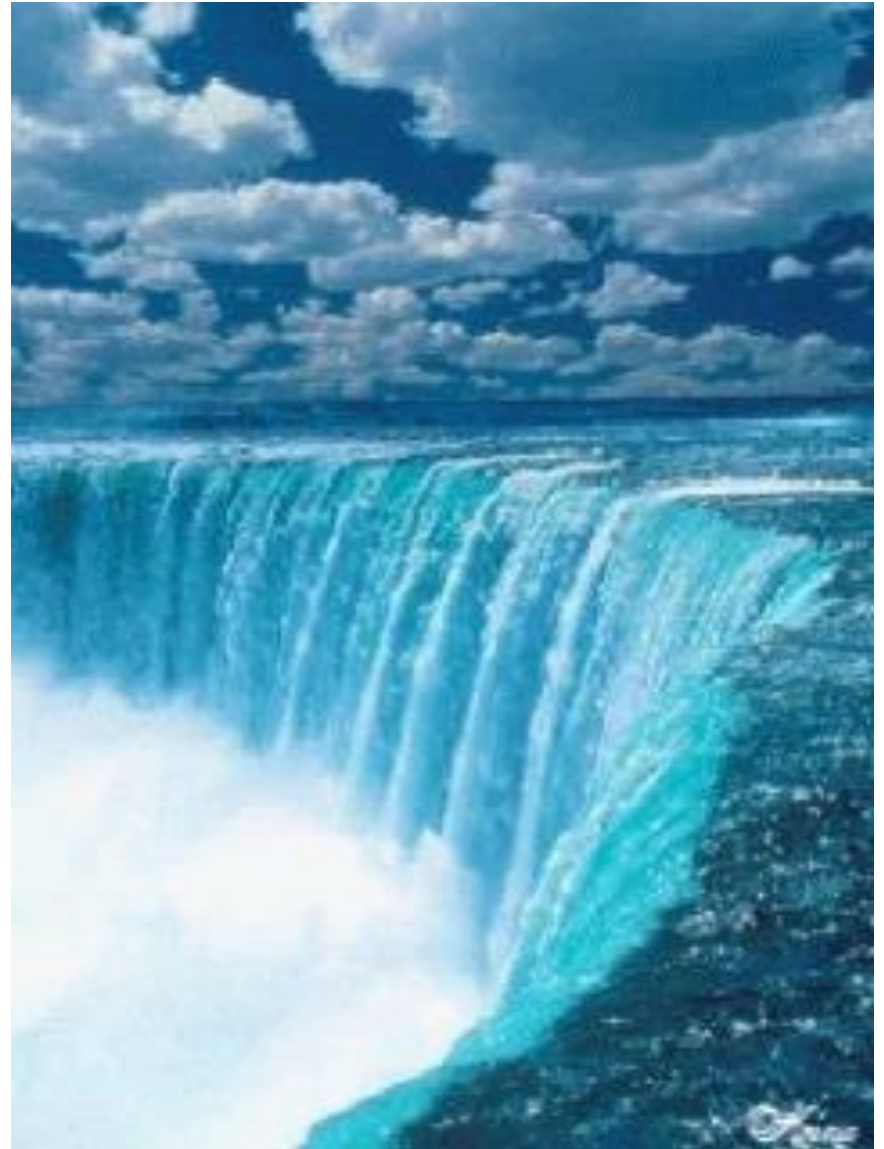
Istanbul University-Cerrahpasa,
Environmental Engineering Department,
Istanbul, TURKEY

Email : nuket@istanbul.edu.tr



WATER : a natural but limited source

- ⚡ social health,
- ⚡ well-being,
- ⚡ preservation of ecosystem,
- ⚡ economic development of a country





20th century

- population growth
- industrialization
- urbanization

water consumption ↗



SHARE

TOGETHER

Main adaptation steps to mitigate effects of climate change on water availability

↳ wastewater treatment,

↳ recycled water use,

↳ seawater/brackish water desalination,

↳ groundwater recharge,

↳ improved and efficient irrigation water management,

↳ correct crop selection,

↳ production of some crop seeds which are drought-tolerant,

↳ adoption of a stricter water use policies,

↳ more research for better understanding of hydrological climate change effects

TURKEY



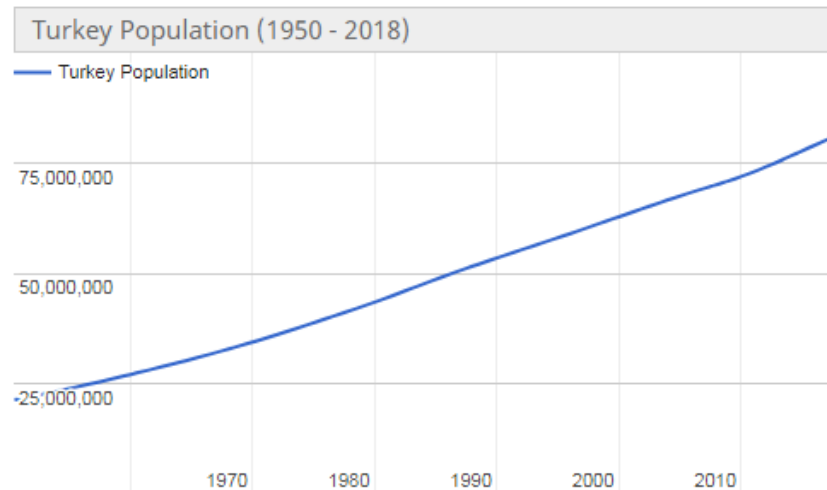
Country Continent World



- The current population of **Turkey** is **82,023,223** as of Monday, August 6, 2018, based on the latest United Nations estimates.
- Turkey population is equivalent to **1.07%** of the **total world population**.
- Turkey ranks number **19** in the list of **countries (and dependencies) by population**.
- The population density in Turkey is 106 per Km² (276 people per mi²).
- The total **land** area is 769,630 Km² (297,156 sq. miles)
- **72.1 %** of the population is **urban** (59,060,906 people in 2018)
- The **median age** in Turkey is **30.2 years**.

Turkey Population (LIVE)

82,035,344





Transboundary water flow
7 km³

annual precipitation
501 km³

evaporation
274 km³

annual water flow
196 km³

aquifer leak
41 km³

water flow
193 km³

gross water potential
234 km³

annual usable surface water
98 km³

TOTAL
usable water
112 km³

annual supply
14 km³

current consumption
54 km³
(48% of total)

2018

1350m³/year

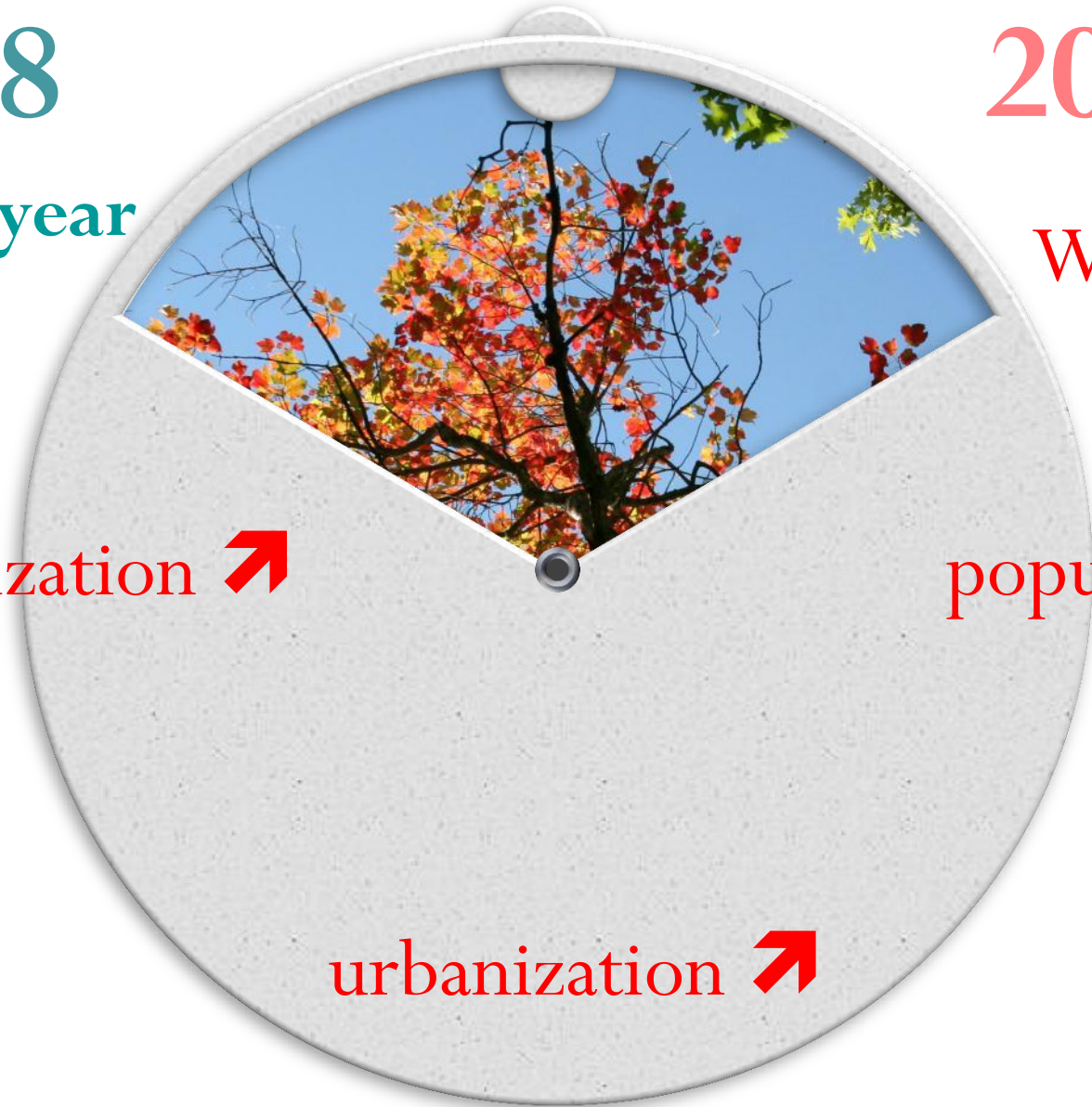
2030

Water
Stress

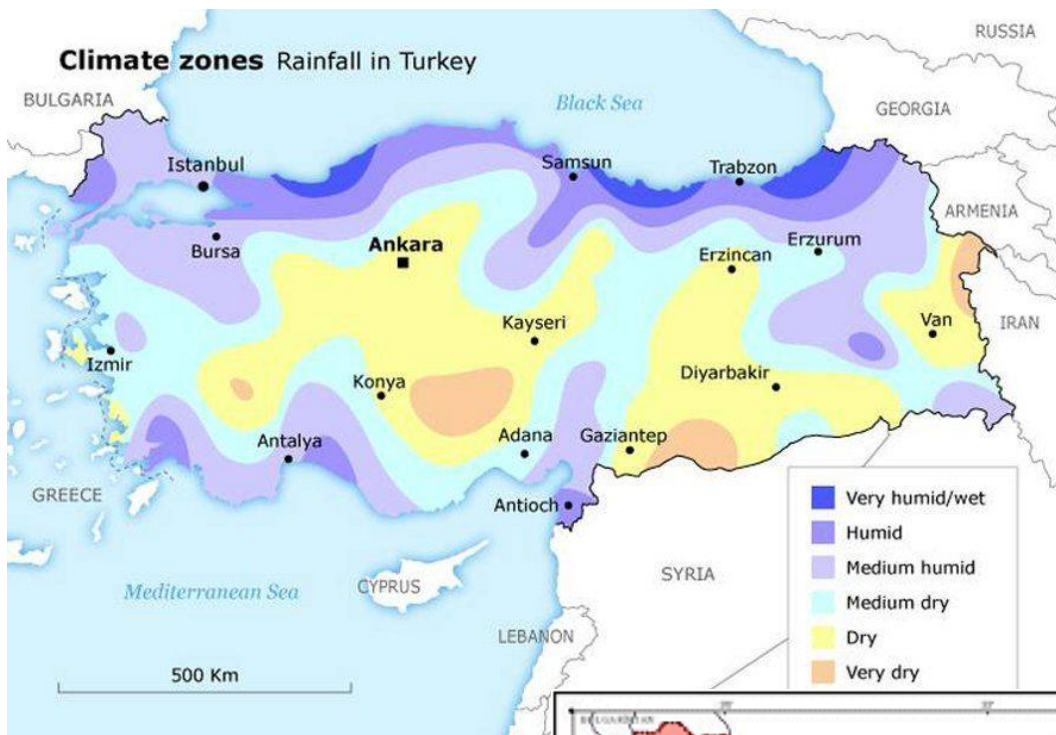
industrialization ↗

population ↗

urbanization ↗



Climate zones Rainfall in Turkey



**AT : 23°C (summer)
-2°C (winter)**

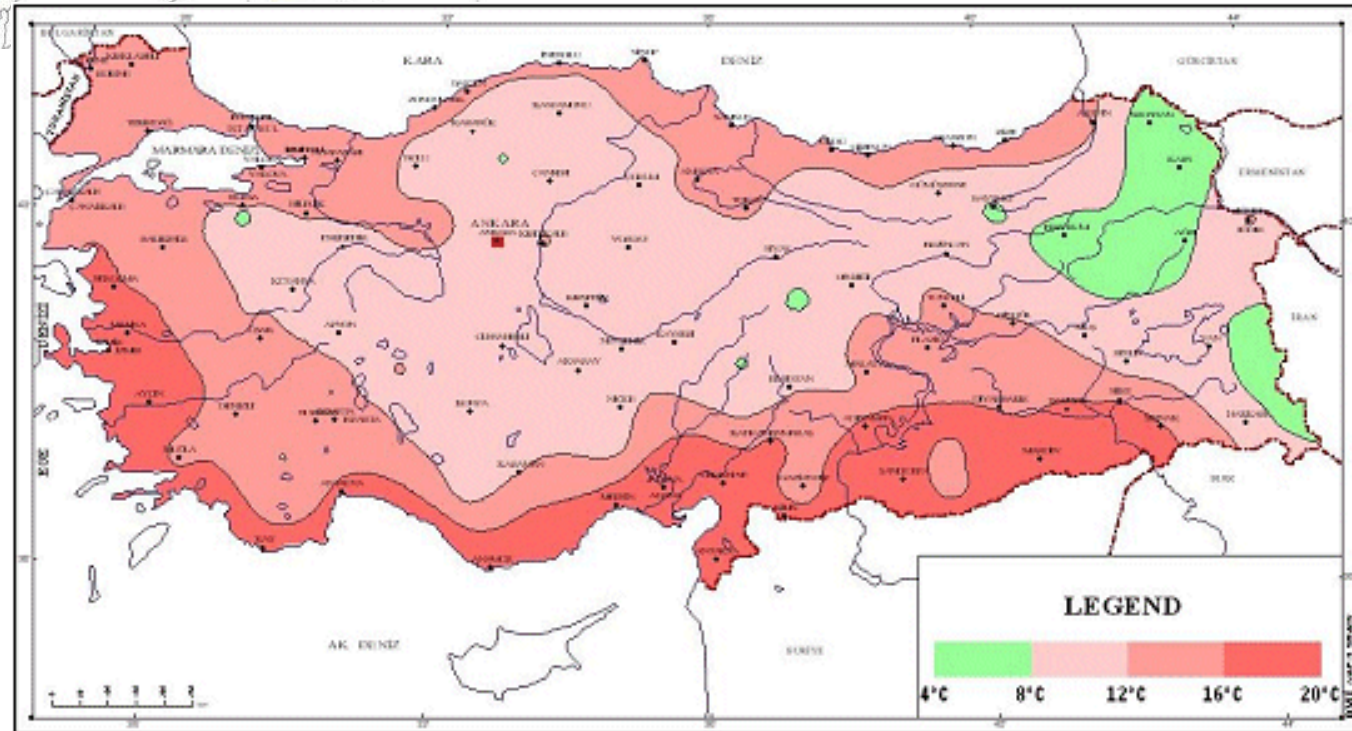
NE : 23°C / 7°C

EA&SE : 17°C / -13°C

AAP : 643 mm

SE : 250 mm

NE : 3000 mm



SALT LAKE



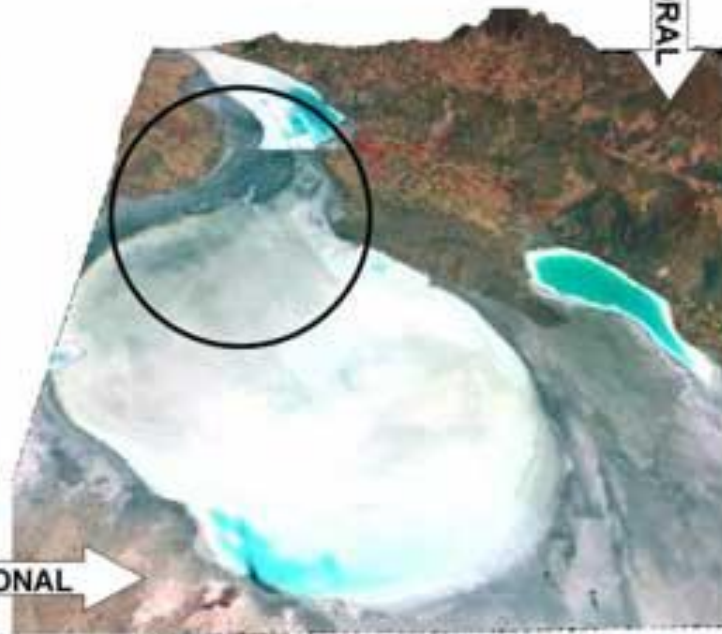
(a) 17/05/1987 (Spot-1)



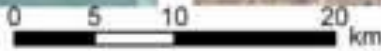
(b) 03/08/1987 (Spot-1)



(c) 17/05/2005 (Spot-4)



(d) 30/07/2005 (Spot-2)



©CNES





HAZAR LAKE



UZUN LAKE



ABANT LAKE



SEYFE LAKE

MEKE LAKE





BEYSEHIR LAKE

*" When the sun goes down,
the sun is undressed and washed in the blue lake. "*



BEYSEHIR LAKE NATIONAL PARK

868.550 m², second largest park



SALDA LAKE





ARTVIN/MACAHEL LAKE

world biosphere reserve
UNESCO 2006







EBER LAKE



BURDUR LAKE

1990



2000



2010



20 10km

NEMRUT CRATER LAKE

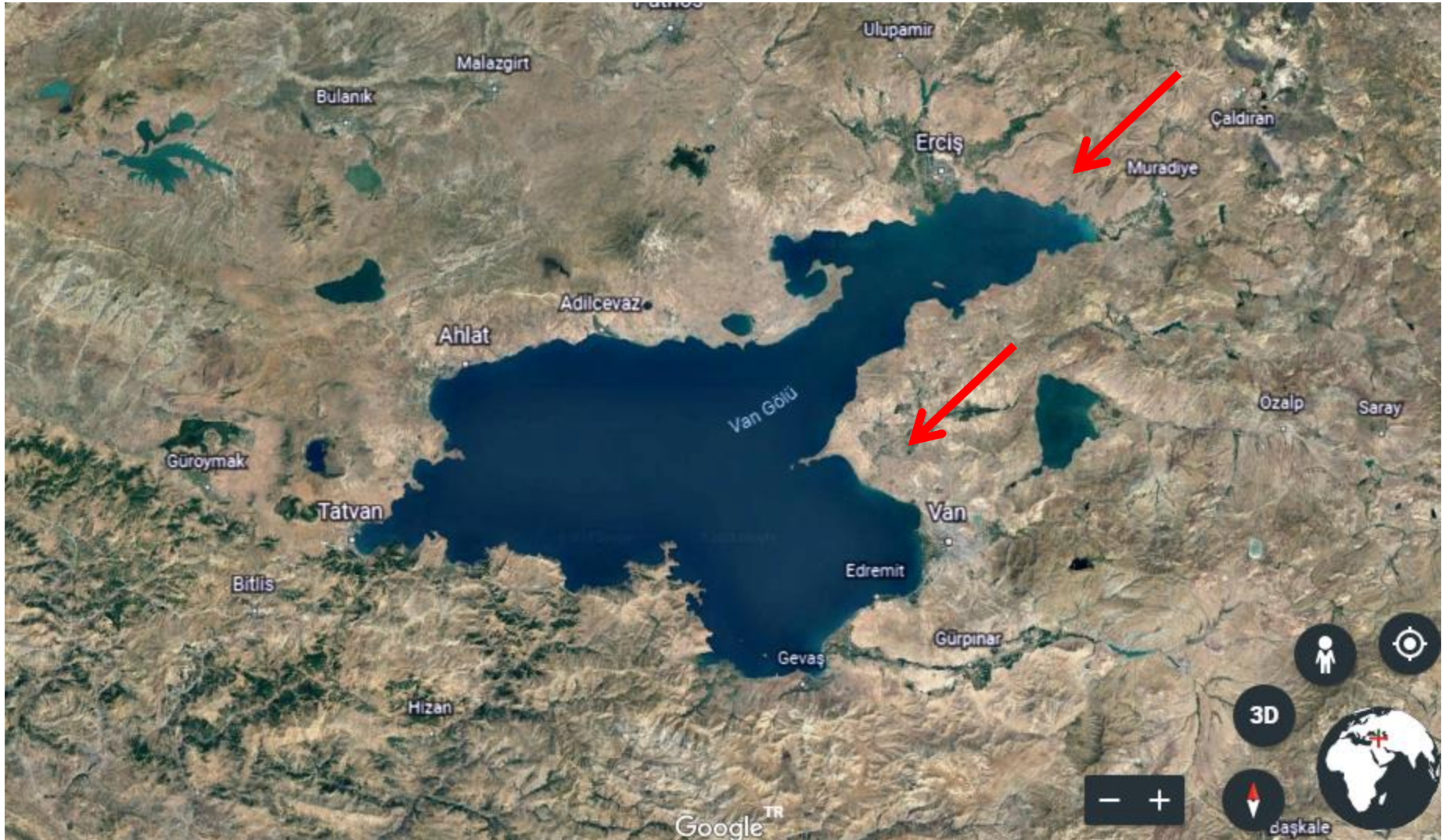


VAN LAKE



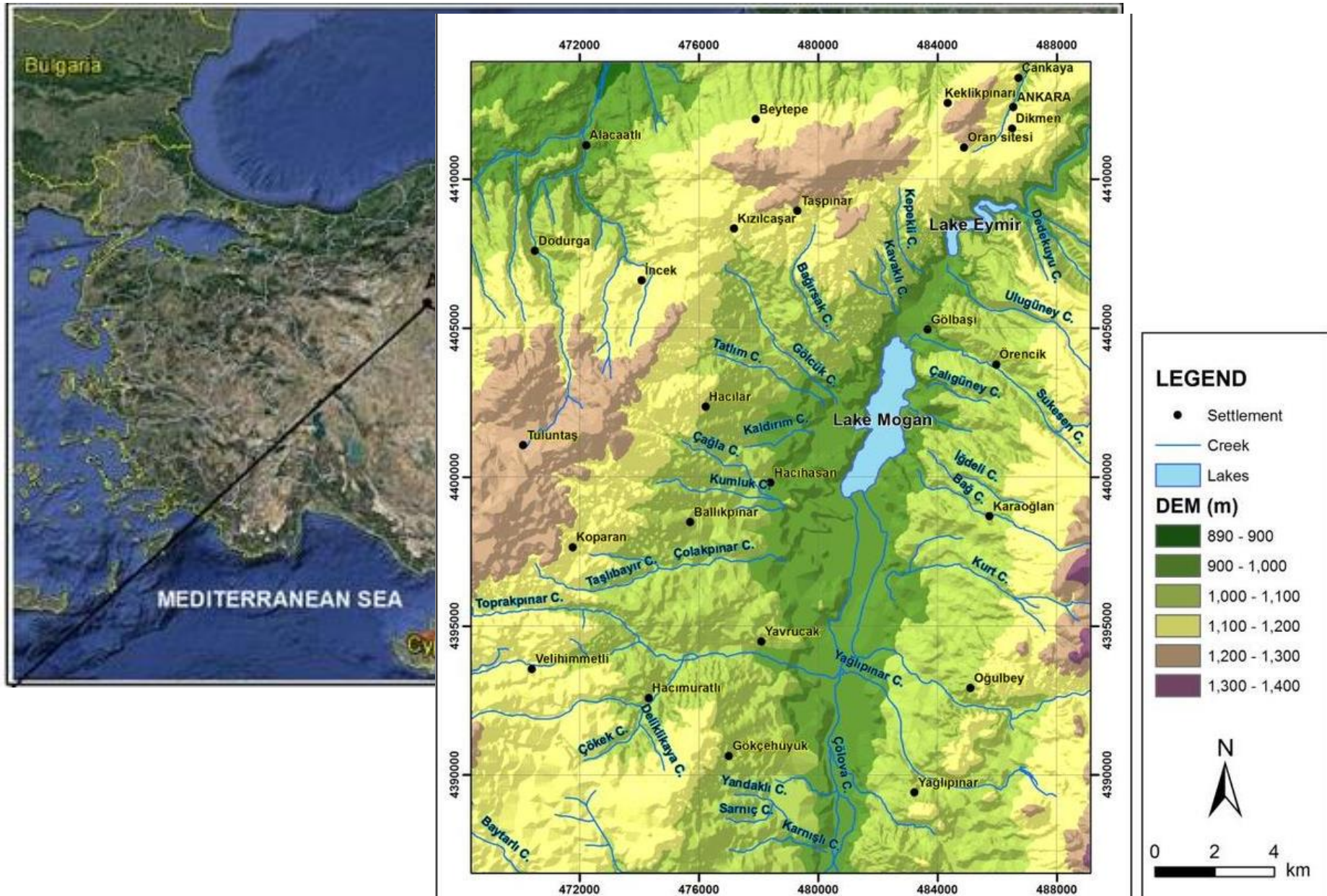


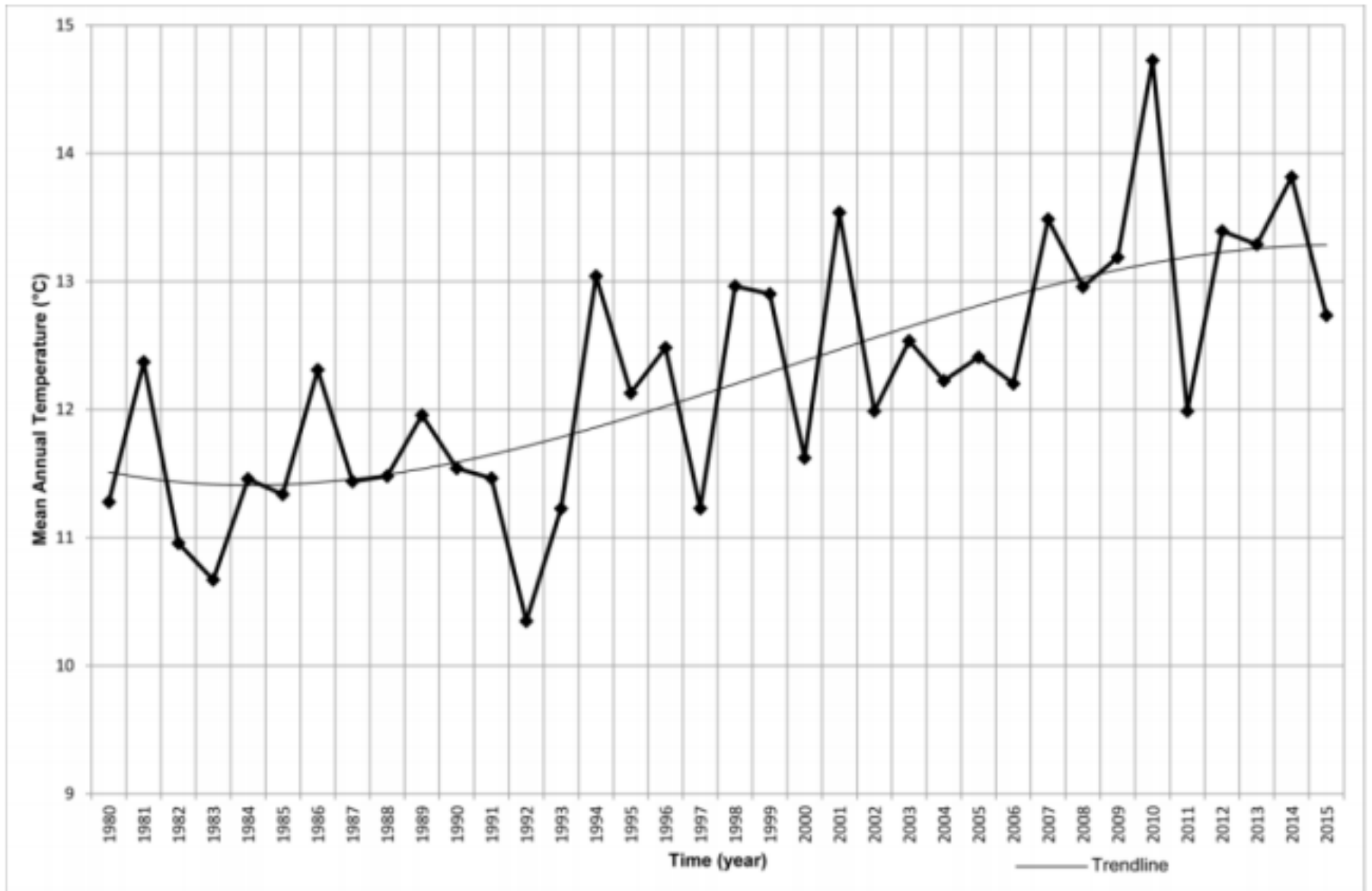
VAN LAKE



Akkus, 2017

LAKE MOGAN





TORTUM WATERFALL



WATER RESOURCES MANAGEMENT

- Determination of existing and future qualitative and quantitative characteristics of surface and groundwater resources, evaluation of supply possibilities,
- Determination, planning and arrangement of community water demands,
- Formation of water balances, collection of factors that will provide continuity of these balances, and development of a long term strategy for rational use of water resources,
- Monitoring of water resources in order to protect them from pollution and exhaustion,
- Planning water resources systems,
- Modeling of management,
- Designation of processes in water systems and operational conditions,
- Increase of assurance of water from quality and quantity point of views,
- Improvement of rational water use,
- Provide sustainability of natural potential of water resources and protect them,
- Provide effective utilization of technical elements (e.g. reservoirs, treatment plants etc.) in order to protect communities from adverse effect of water resources,

The Directorate General of Hydraulic Works



T.C.
Orman ve Su İşleri
Bakanlığı



The General Directorate of Water
Management



Ministry of Forestry & Water Affairs (MoFWA)

Projects of Environment & Water Sciences Departments
of all Universities

SKI General Directorates for Water and
Wastewater Administration

Ministry of Environment and Urbanization (MoEU)

ALL ORGANIZATIONS WITH TITLE «WATER»

Main purposes :

Sustainability & Integration

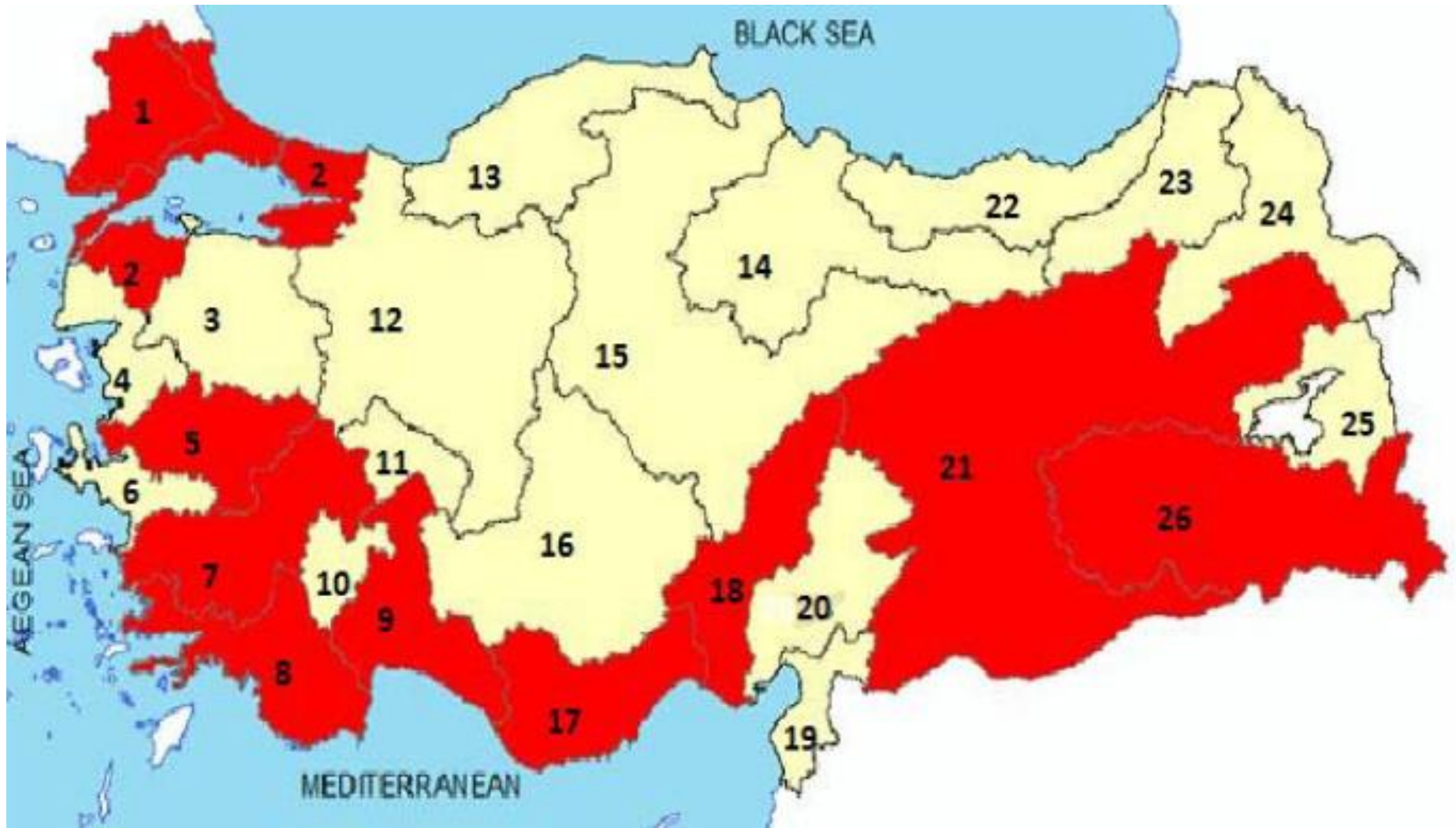
- *Determination, planning, modelling and arrangement of water demands
- *Provide sustainability of natural potential of water resources and protect

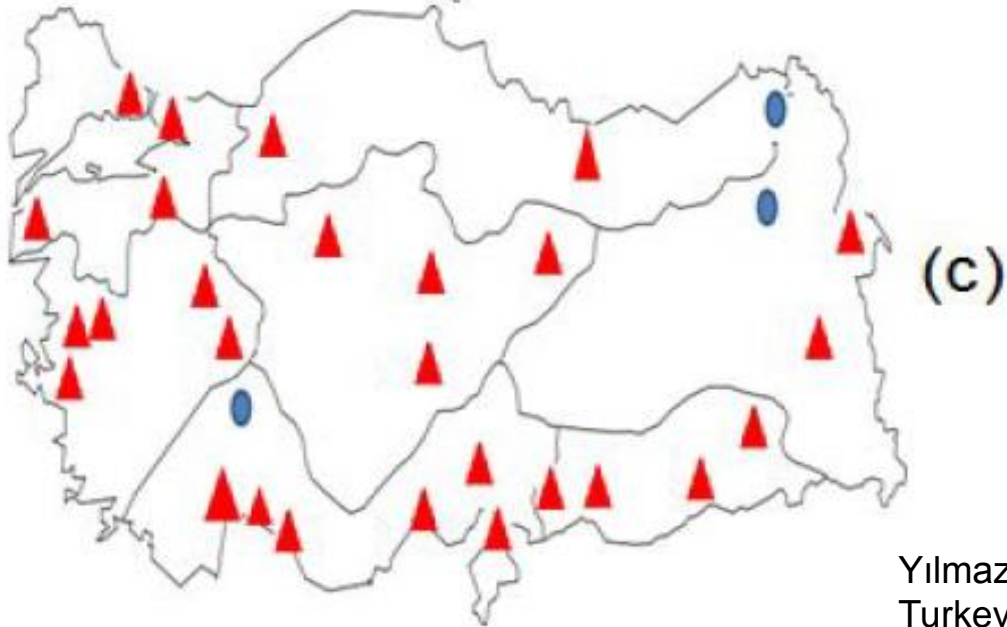
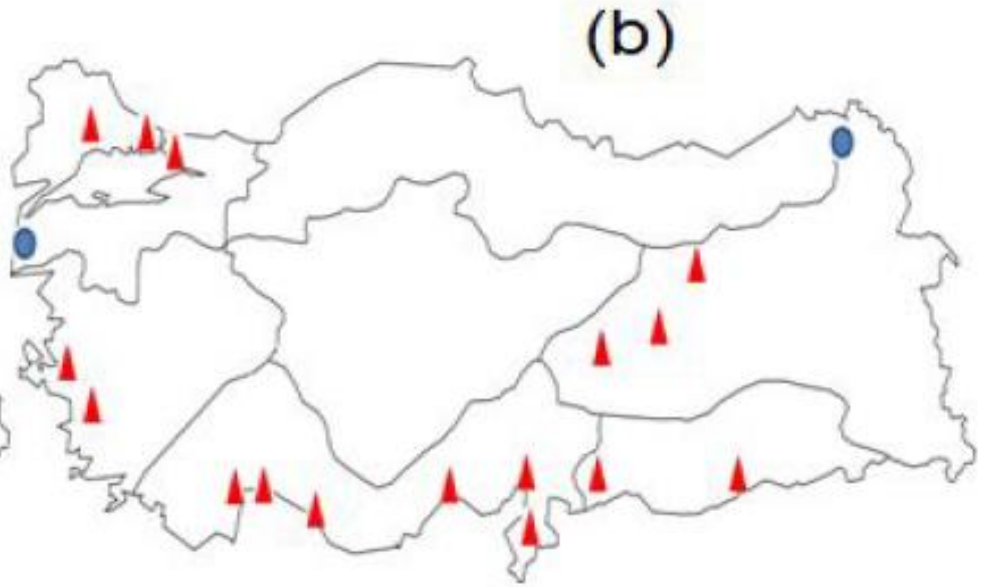
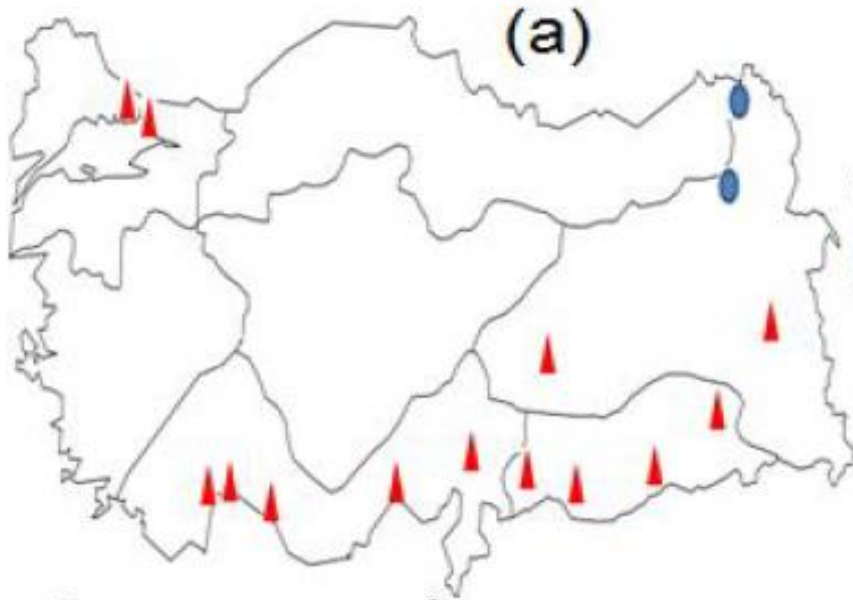
1. **Basin Management Plans**
2. **Integrated Water Management**
3. **Transboundary Water Management**

Basins in Turkey (CESI-ScI)



River basins and climate change high risk zones in Turkey





Yılmaz&Imteaz; Climate change and water resources in Turkey: A review, International Journal of Water, 2014

BASIN PROTECTION ACTION PLANS



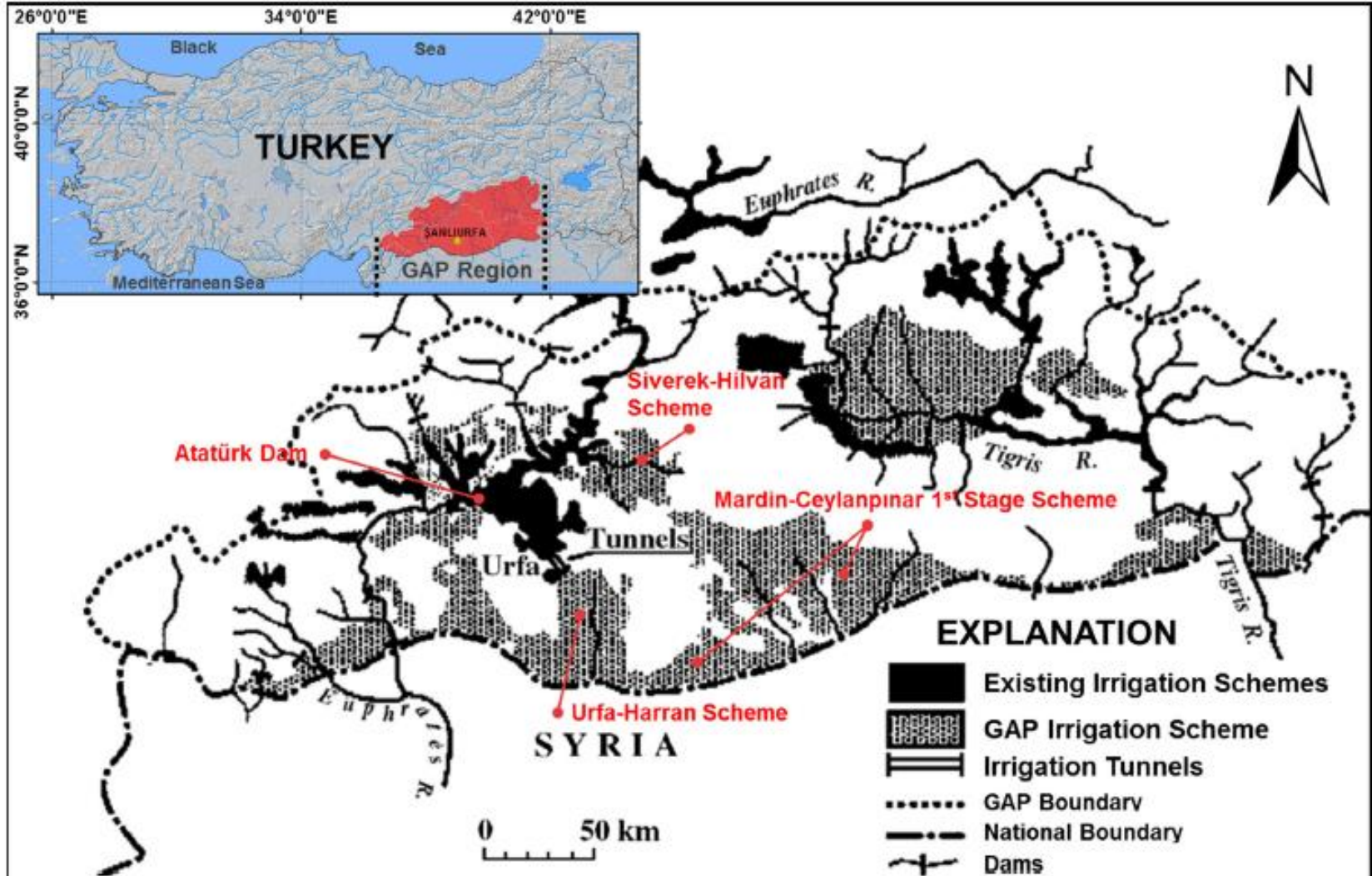
Legend

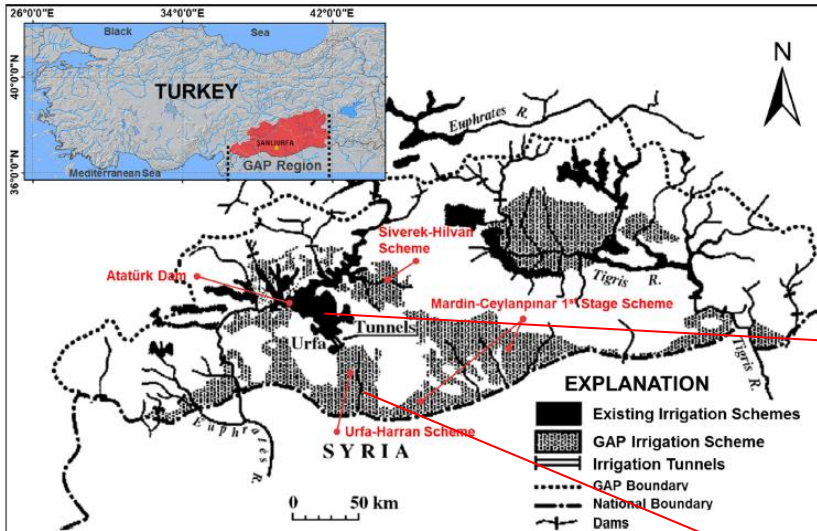
- Started in the last quarter of 2011
- Will be revised
- Will be finished

0 125 250 500 km



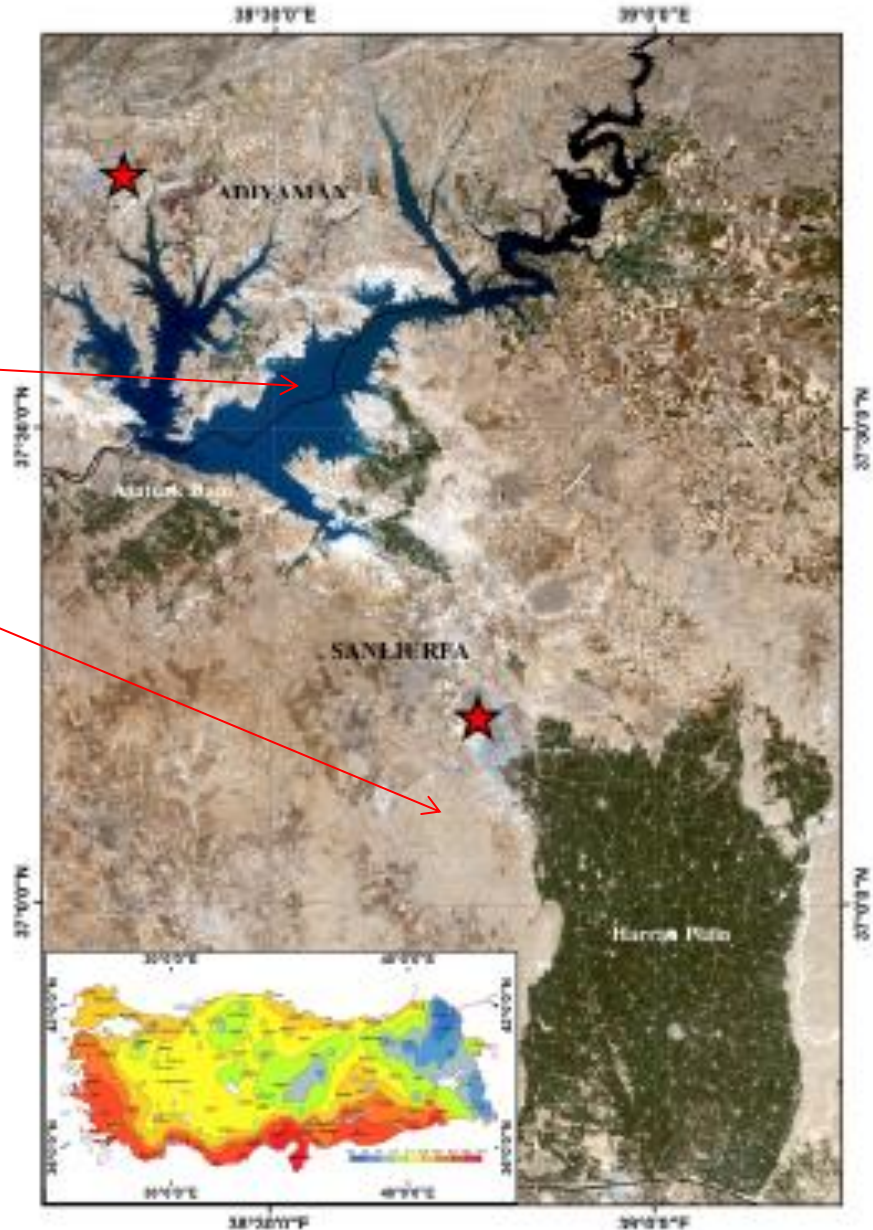
GAP Project



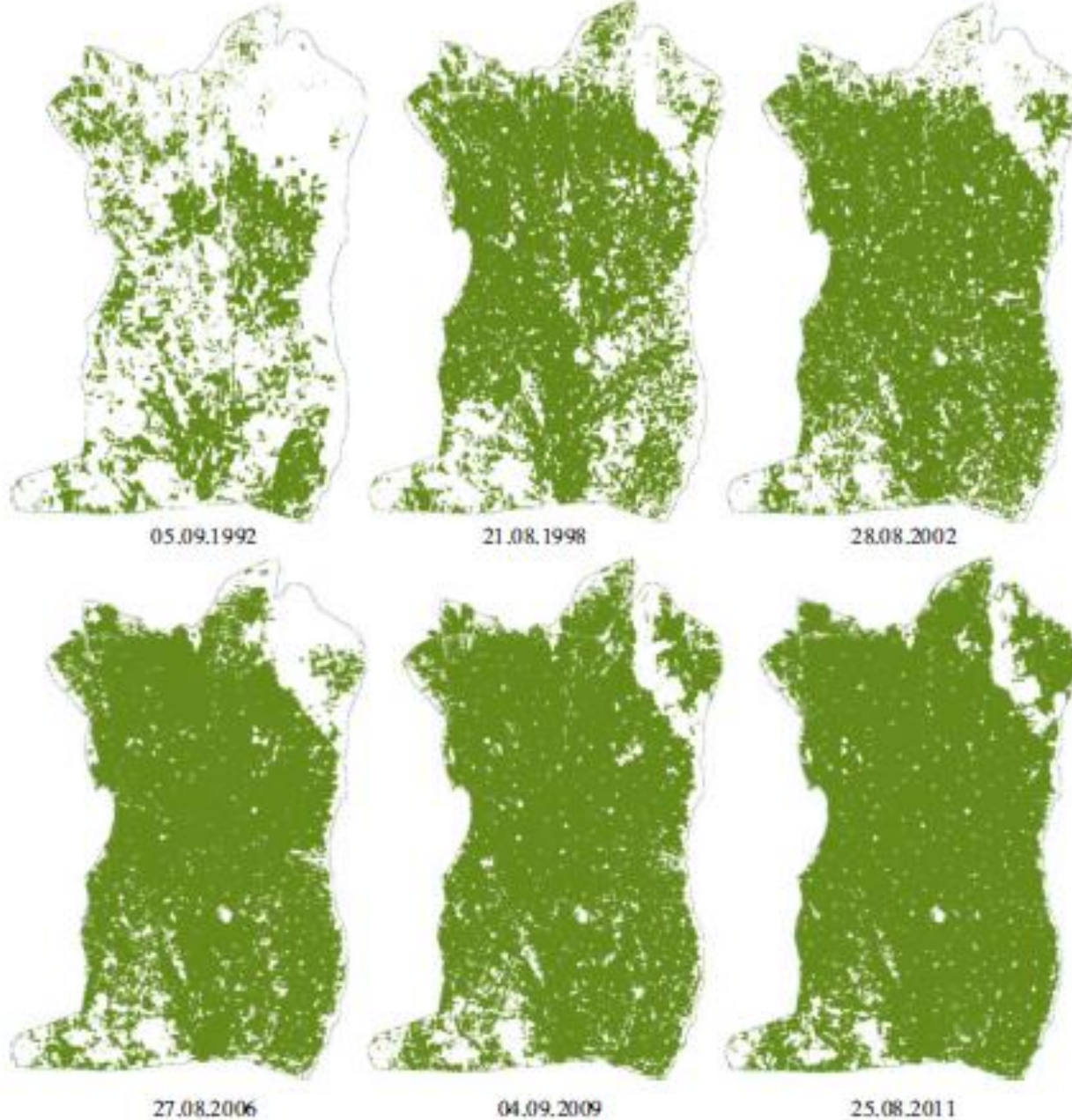


Location of planned irrigation schemes of GAP

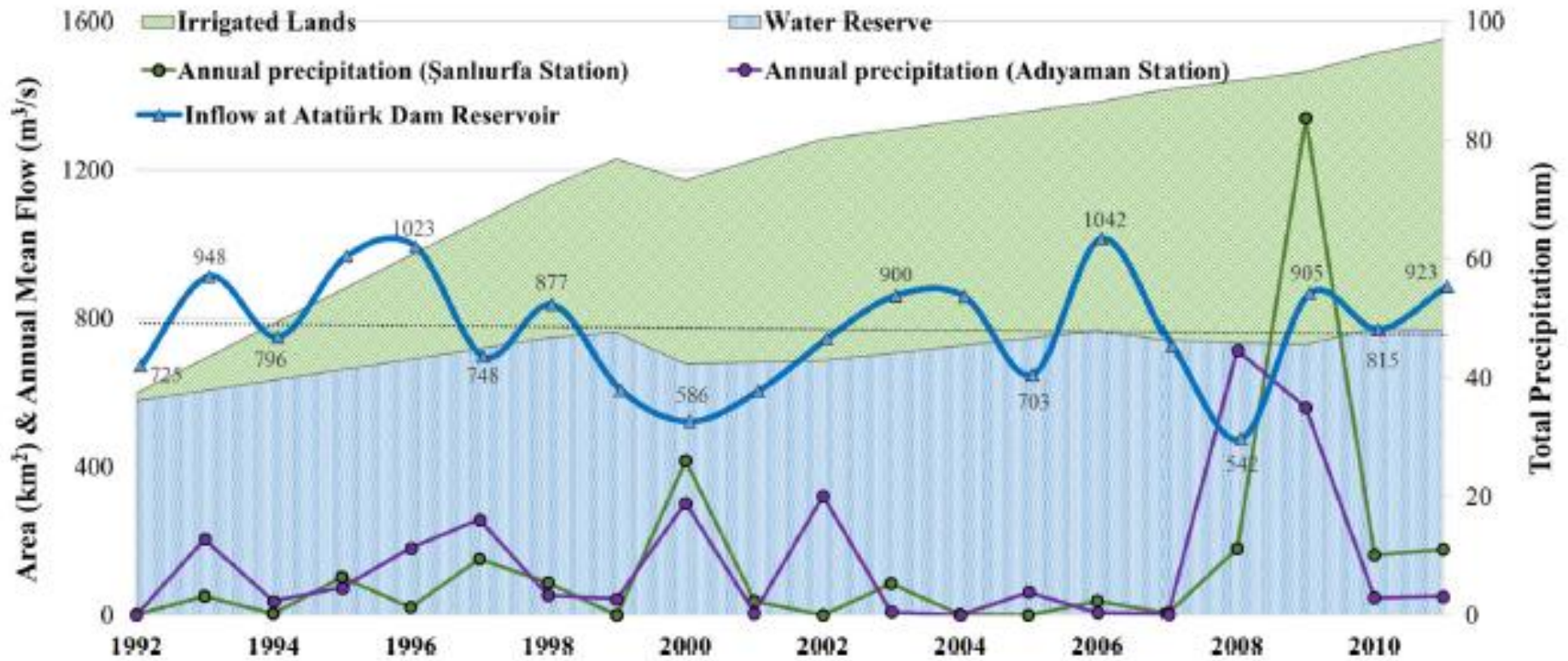
GAP Project & Harran Plain



Spatiotemporal patterns of irrigated agricultural fields on Harran Plain within the mid to late summer times



Changes in Harran Plain irrigated lands and water reserve with mid-to-late summer total precipitations





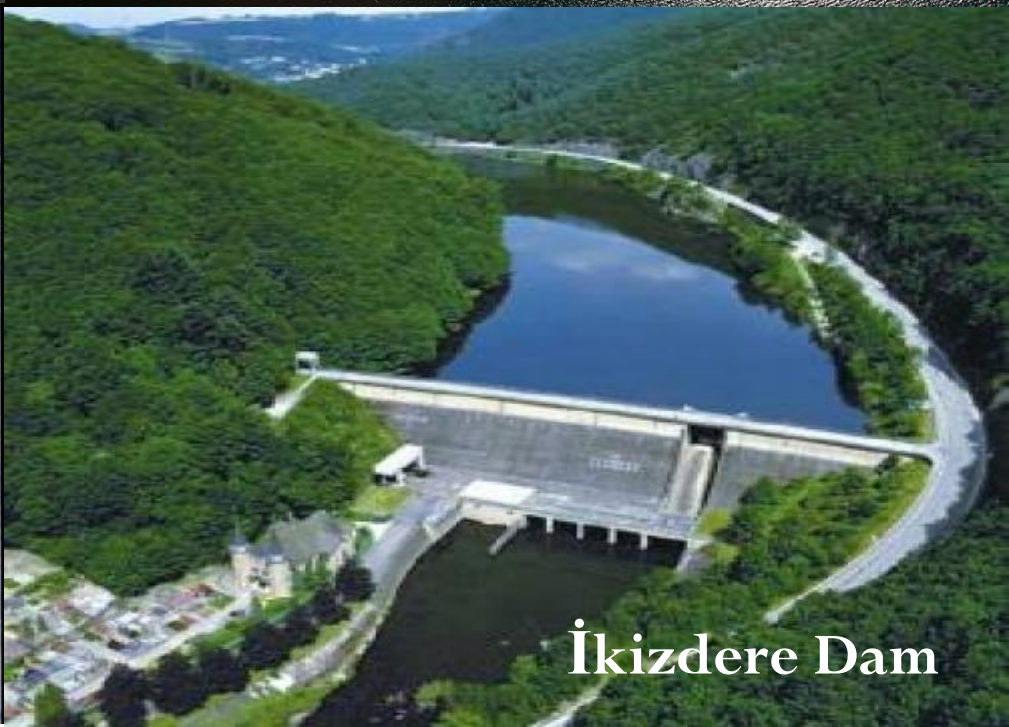
Atatürk Dam



Keban Dam



Karakaya Dam



İkizdere Dam

ADIYAMAN DAM PROJECT





Integrated water management in Turkey (CESI-ScI)



Transboundary Water Management

*«water should be utilized among riparian states
in an equitable, reasonable and optimal way»*



An aerial photograph of a river flowing through a dense, lush green forest. The river is the central focus, winding through the valley and surrounded by thick vegetation. The text is overlaid on the top left of the image.

holistic approach
technical and financial support
regional and international organizations
financial institutions

תודה

Dankie Gracias

Спасибо

شكراً

Merci Takk

Köszönjük

Terima kasih

Grazie Dziękujemy Dékojame

Ďakujeme Vielen Dank Paldies

Kiitos Tänname teid

谢谢

Thank You Tak

感謝您 Obrigado Teşekkür Ederiz

감사합니다

Σας ευχαριστούμε ขอบคุณ

Bedankt Děkujeme vám

ありがとうございます

Tack