# IMPACT OF CLIMATE CHANGE ON THE POLITICS OF WATER RESOURCES: TURKEY AND BEYOND

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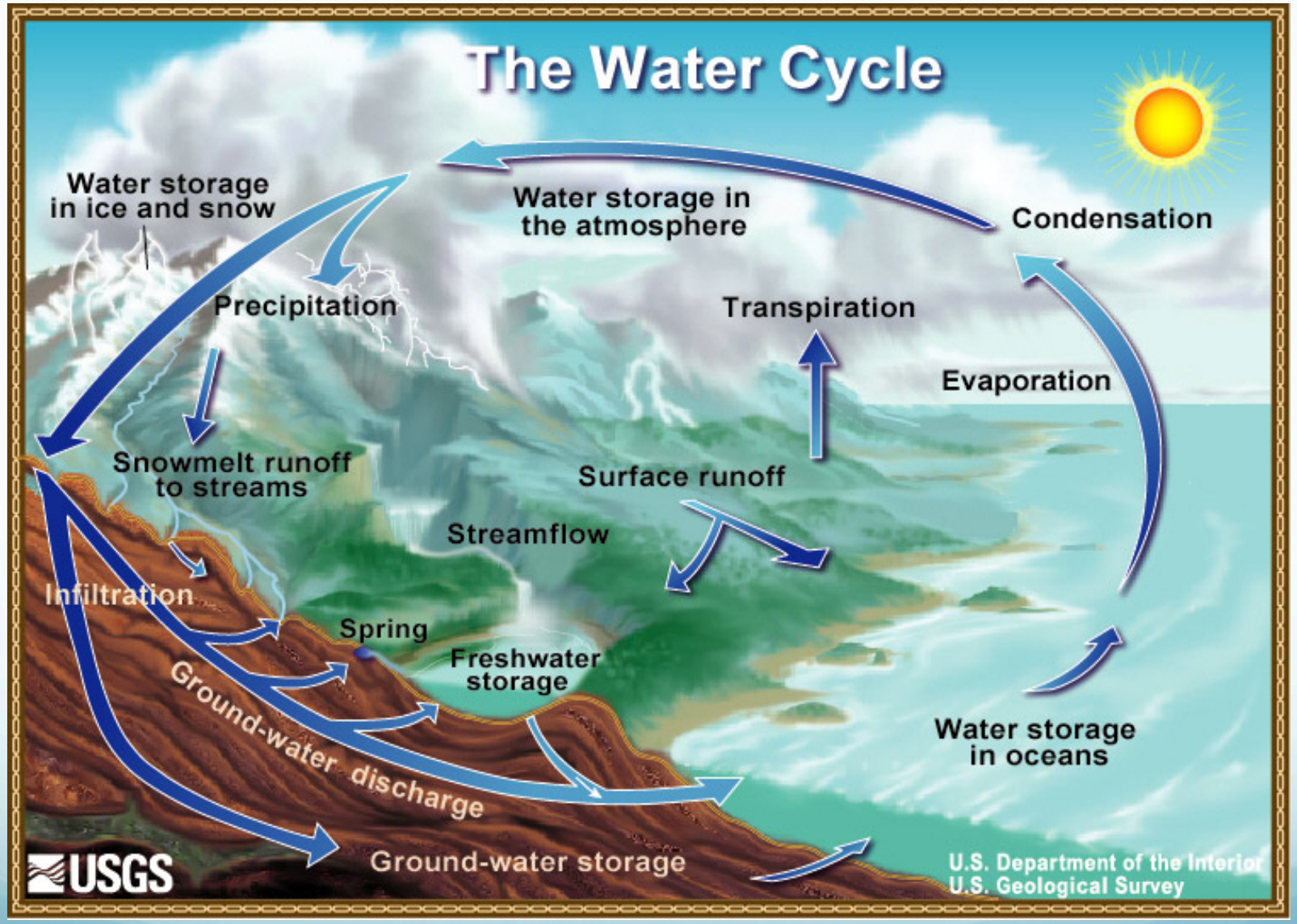
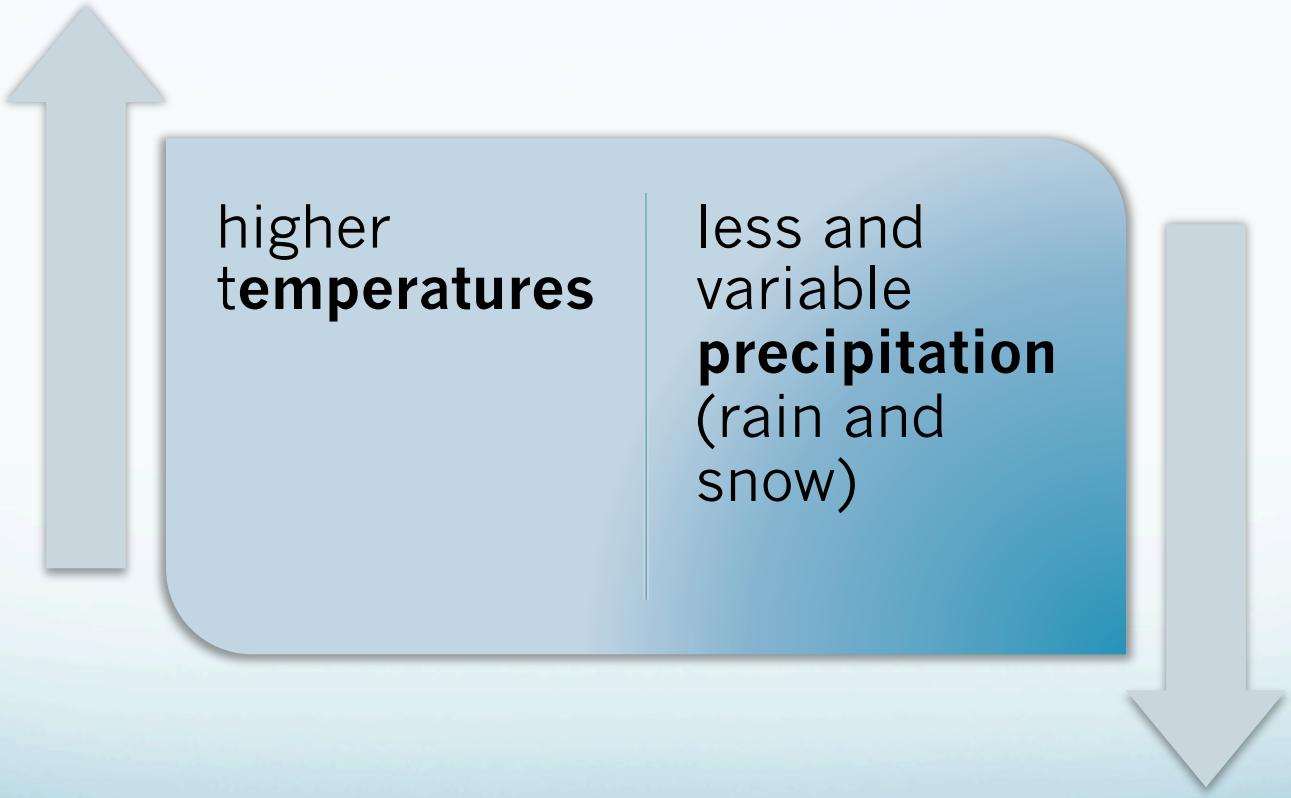
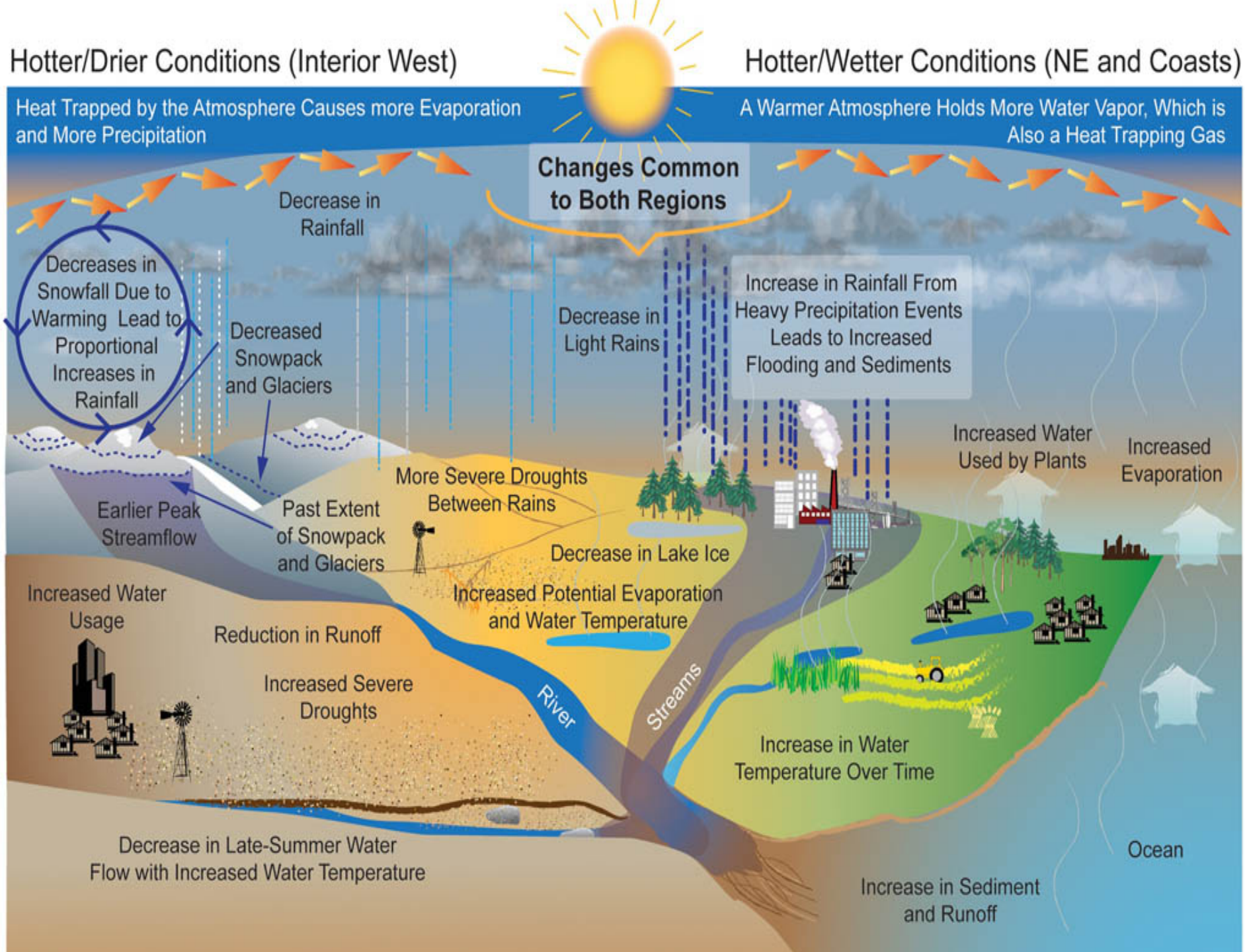

The Water Cycle
Water storage in ice and snow
Water storage in the atmosphere
Condensation
Precipitation
Transpiration
Evaporation
Snowmelt runoff to streams
Surface runoff
Streamflow
Infiltration
Spring
Freshwater storage
Ground-water discharge
Water storage in oceans
Ground-water storage
USGS
U.S. Department of the Interior
U.S. Geological Survey

# Climate Impacts on Water Resources




Hotter/Drier Conditions (Interior West)
Hotter/Wetter Conditions (NE and Coasts)
Heat Trapped by the Atmosphere Causes more Evaporation and More Precipitation
A Warmer Atmosphere Holds More Water Vapor, Which is Also a Heat Trapping Gas
Changes Common to Both Regions
Decrease in Rainfall
Decreases in Snowfall Due to Warming Lead to Proportional Increases in Rainfall
Decreased Snowpack and Glaciers
Decrease in Light Rains
Increase in Rainfall From Heavy Precipitation Events Leads to Increased Flooding and Sediments
Increased Water Used by Plants
Increased Evaporation
More Severe Droughts Between Rains
Earlier Peak Streamflow
Past Extent of Snowpack and Glaciers
Decrease in Lake Ice
Increased Potential Evaporation and Water Temperature
Increased Water Usage
Reduction in Runoff
Increased Severe Droughts
River
Streams
Increase in Water Temperature Over Time
Decrease in Late-Summer Water Flow with Increased Water Temperature
Ocean
Increase in Sediment and Runoff

# What do "increasing temperatures" and "reducing and shifting precipitation" mean for the water users?

- **Droughts**: We have been experiencing increases in the severity and length of droughts; this has been especially of concern in the south.

- **Floods**: Warming winter temperatures cause more precipitation to fall as rain rather than snow. Furthermore, rising temperatures cause snow to begin melting earlier in the year. This alters the timing of streamflow in rivers and end up with floods.

# MAJOR REASONS BEHIND THE WATER CRISIS
# (How we explained through 1980s, 1990s 2000s)

*1980s*

- Population growth
- Economic growth
- Inefficiency

*1990s*

- **Governance failures:**

❑ non-existence of institutions;

❑ ineffective, inefficient and inequitable practices;

❑ lack of enforcement

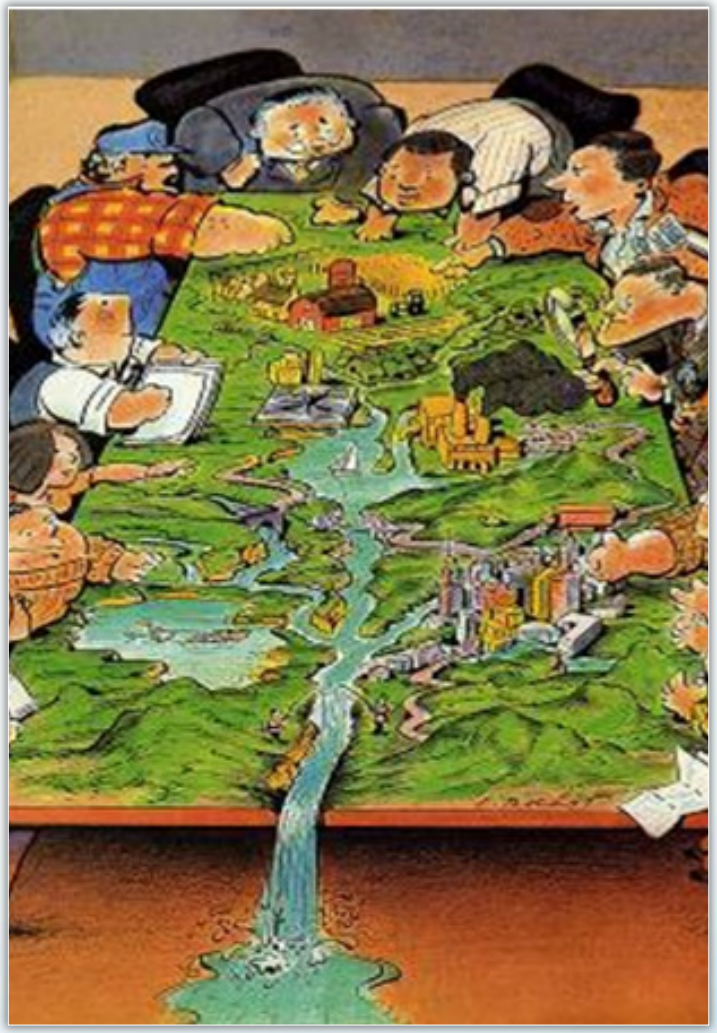
*2000s*

- Climate change (more emphasis)

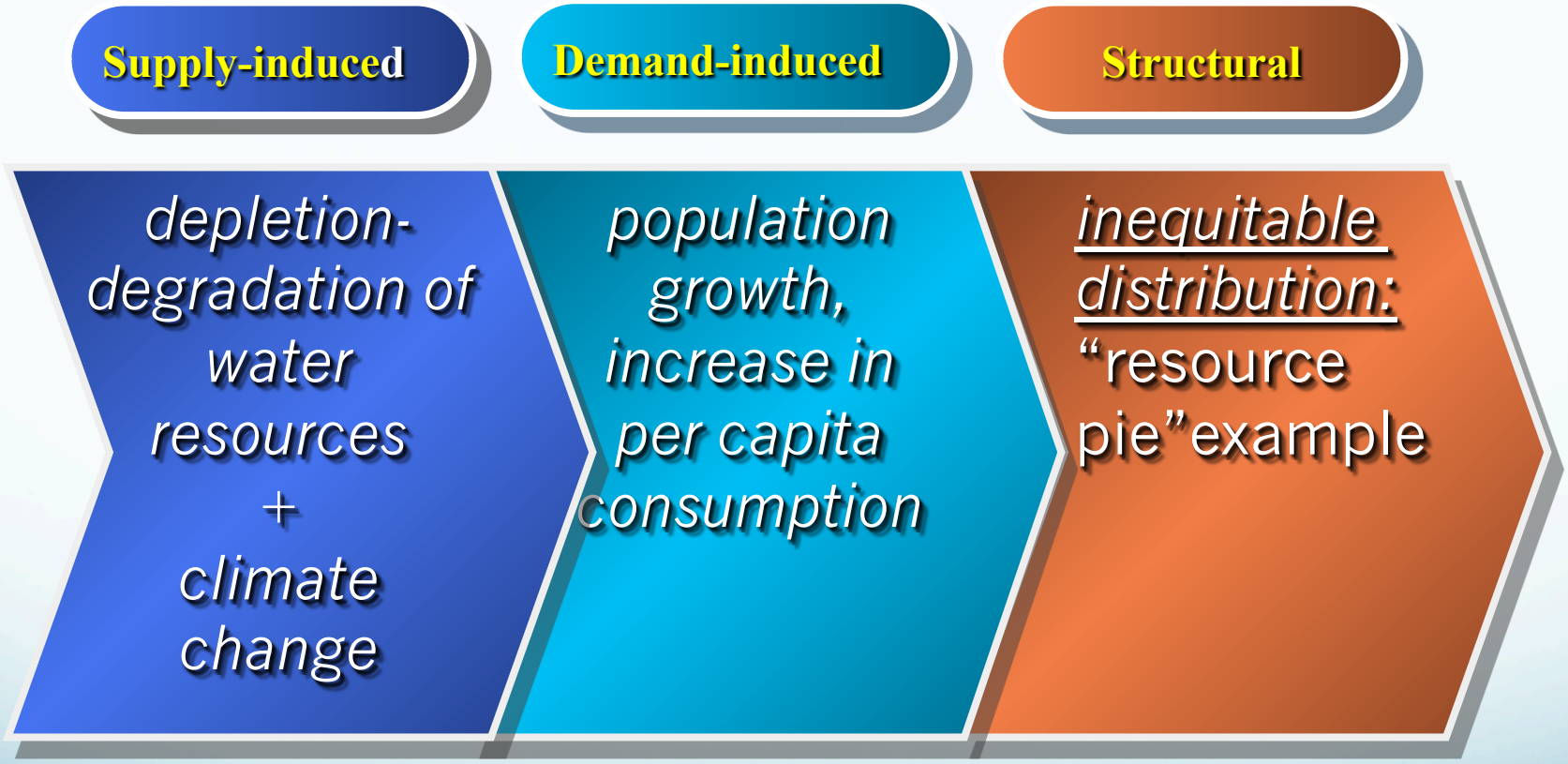
**Climate change complicates this picture with more uncertainties**

**Water allocation and management is a <u>political process</u>**

- Sectoral uses put pressure on water resources, stresses that are likely to be exacerbated by climate change. In many areas, climate change is likely to increase water demand while shrinking water supplies.
- This shifting balance would challenge water managers to simultaneously meet the needs of growing communities, sensitive ecosystems, farmers, ranchers, energy producers, and manufacturers.



# Water Politics: What Kind Of Water *Scarcity* Are We Talking About?



# CLIMATE CHANGE and NATIONAL WATER MANAGEMENT: TURKEY

- Agenda Formation
- Institutional Development
- Implementation

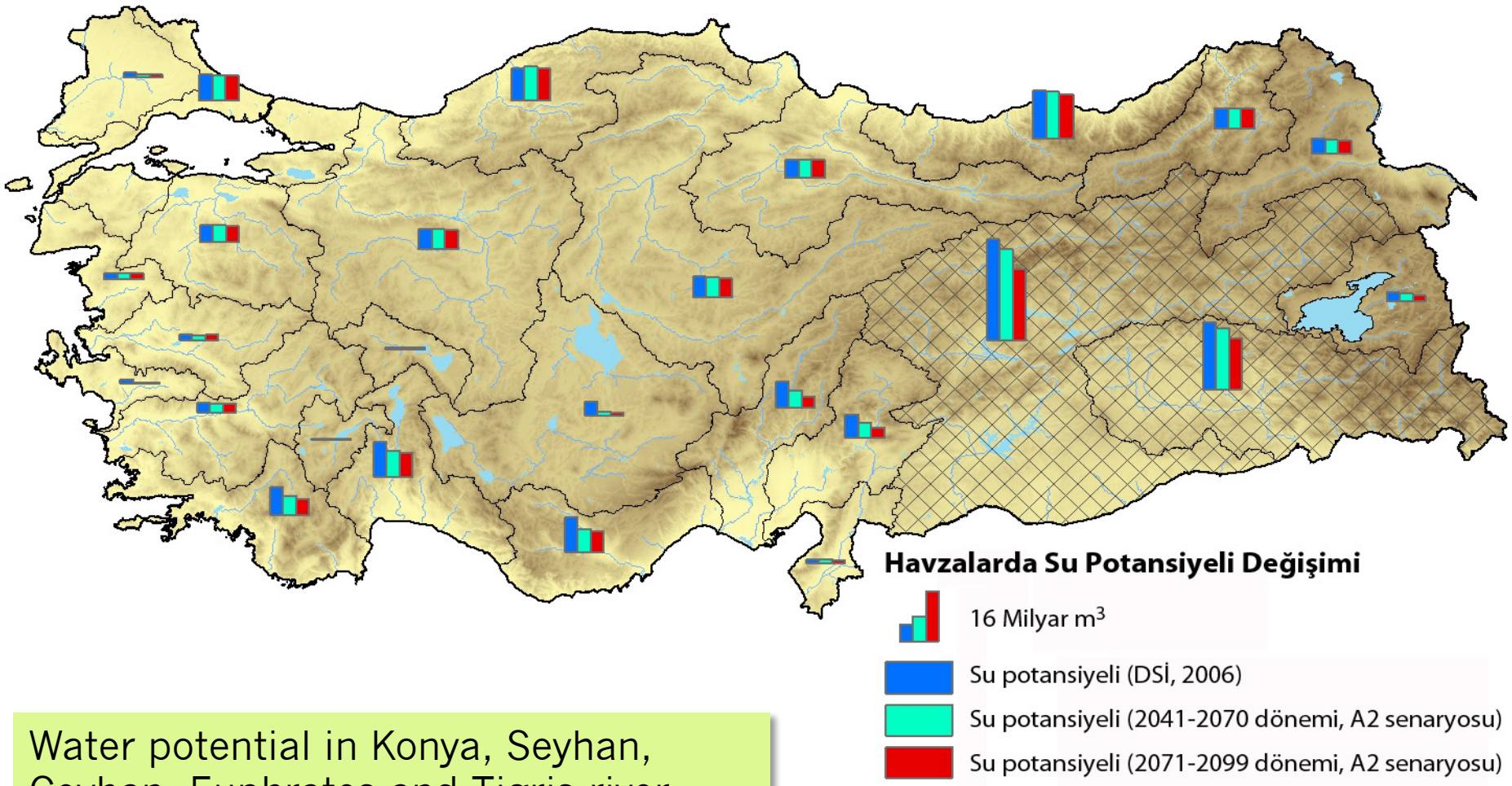
# Agenda Formation

Climate change impacts on water quantity, quality, WSS and ecosystems have been recognized and delineated at governmental and non-governmental circles

- Prominent increase in summer **temperature** across the country
- Significant decrease in winter **precipitation** in the western provinces over the last fifty years.

«**Climate change should be taken into account in water management and any other activities related to water**.”
MoFWA, 2014

# Water Potential Changes in the River Basins in Turkey




Water potential in Konya, Seyhan, Ceyhan, Euphrates and Tigris river basins will decrease.

Ömer L. Şen, A Holistic View of Climate Change and its impacts in Turkey, IPC, 2013

# Institutional Development

*Policy instruments:*

In 2012 National Climate Change Adaptation Strategy and Action Plan is adopted by the Ministry of Environment and Urbanisation with specific references to water resources.

# *New government depts. opened, old ones reorganized; government-NGO dialogue started:*

| | | | |
|---|---|---|---|
| Ministry of Forestry and Water Affairs: General Directorate for Water Management, Floods and Droughts Unit, Climate Change and Adaption sub-unit<br>• General Directorate of State Hydraulic Works, Investigation, Planning and Allocations Dept., Flood Control Unit<br>• Turkish State Meteorological Service | Ministry of Environment and Urbanization, General Directorate of Environmental Management, Department of Climate Change, | Ministry of Foreign Affairs, Deputy DG Energy, Water and Environment | WWF-Turkey-TEMA-Greenpeace Akdeniz (İklim Ağı=Climate Network) |

# Projects Kicked-off:

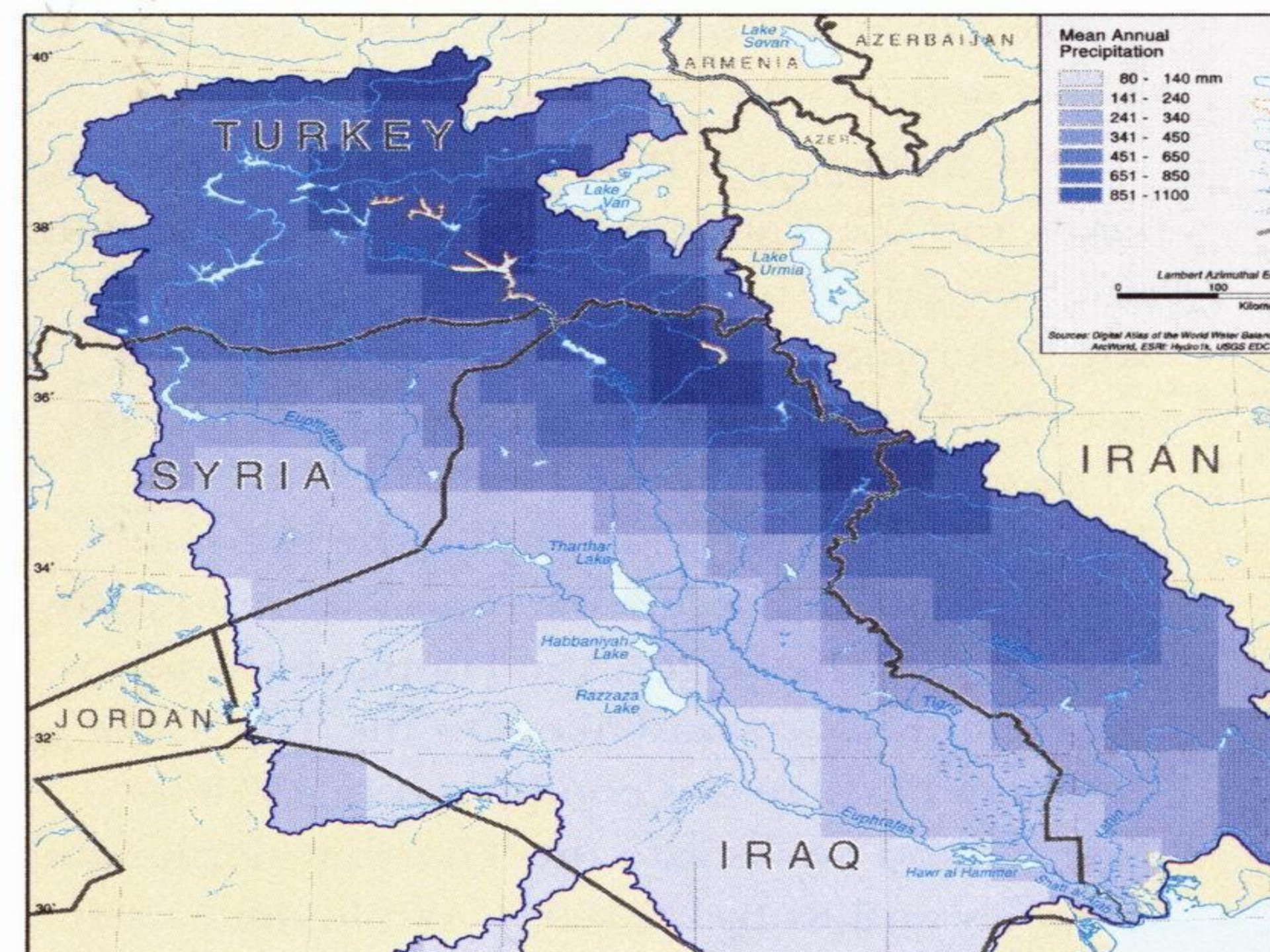
- Climate Change Impacts on Water Resources (**25 river basins**), 2013-2016, lead authority DG, Water Management, MoFWA
- Drought (**Konya** and **Akarçay** basins) and flood management (**Yeşilırmak** and **Antalya** basins) plans
- Istanbul Technical University – "Impact of Climate Change on the **Euphrates** River Flows" (supported by TÜBITAK) underway since 2010.
- DSI 6th Regional Directorate – "Identification of Surface Water Resources Potential and Flood Risks within the Perspective of Developing Water Resources Management Policies in **Seyhan** Basin within the Framework of Adaptation to Climate Change Project"

# Implementation

- at early stages;
- complex, uncoordinated;
- ineffective;
- adaptation policies and practices stay only in rhetoric.
- have not empowered the planners/decision-maker and the users to cope with the negative impacts and to adapt to the new conditions
- reactive (to disasters, droughts and floods) not proactive
- water resources development (dam construction and inter-basin water transfers) still dominates the policy and implementation as opposed to demand management (efficiency) and equitable use.

# Climate Change and Transboundary Water Management: Euphrates-Tigris As The Case-study

# Euphrates-Tigris River Basin


Mean Annual Precipitation
80 - 140 mm
141 - 240
241 - 340
341 - 450
451 - 650
651 - 850
851 - 1100
Lambert Azimuthal E
0
100
Kilom
Sources: Digital Atlas of the World Water Balanc
ArcWorld, ESRI; HydroIk, USGS EDC
TURKEY
SYRIA
IRAQ
IRAN
JORDAN
ARMENIA
AZERBAIJAN
AZERB.
Lake Sevan
Lake Van
Lake Urmia
Euphrates
Tharthar Lake
Habbaniyah Lake
Razzaza Lake
Tigris
Euphrates
Hawr al Hammar
Shatt al Arab
Kabir
40°
38°
36°
34°
32°
30°

# Climate (Natural Conditions)

The climatic conditions demonstrate the fact that both the Euphrates and Tigris flow through semi-arid and arid regions within Syria and Iraq, since 60 percent of the Syrian territory receives less than 250 mm of **precipitation** while 70 percent of Iraq is subject to 400 mm per year.

Another extremely important climatic feature in the Euphrates-Tigris river basin is the **high temperature** resultant in high **evaporation**.

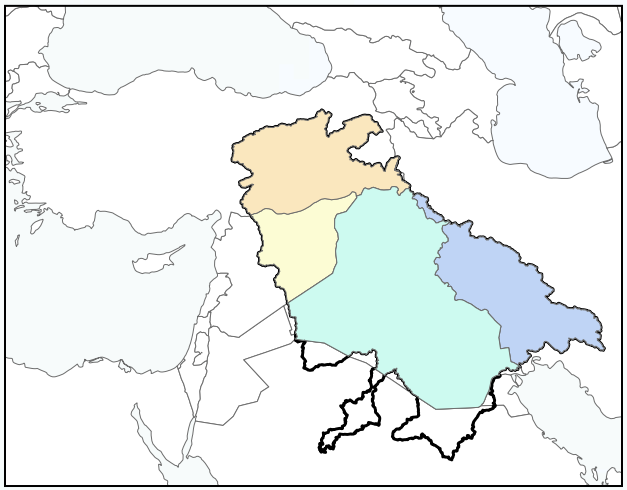
Heavy **evaporation** also reinforces **salinization** and **water loss** in major reservoirs like Keban and Atatürk dams in Turkey, Assad dam in Syria, and Lake Habbaniya and Thartar Canal in Iraq.

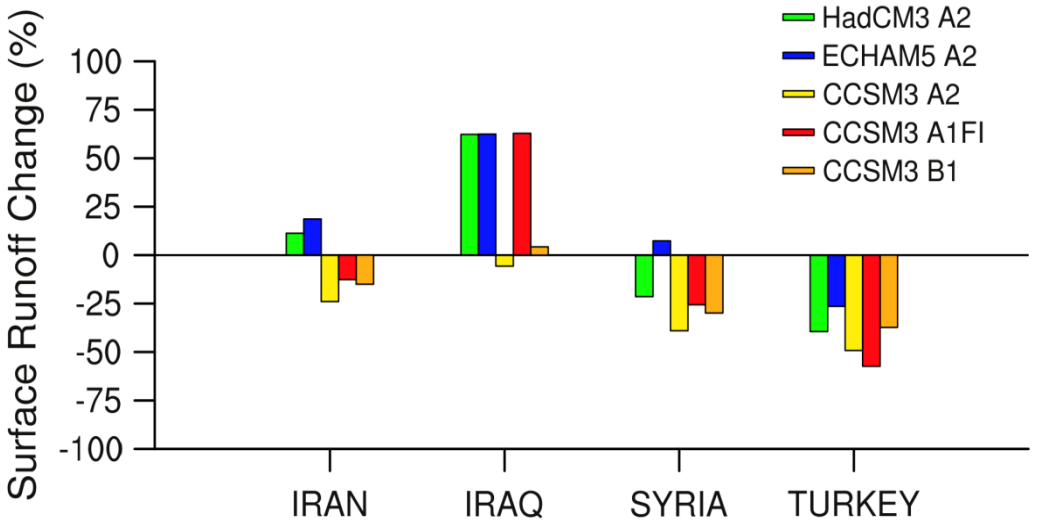
# Current Knowledge about Impacts of Climate Change

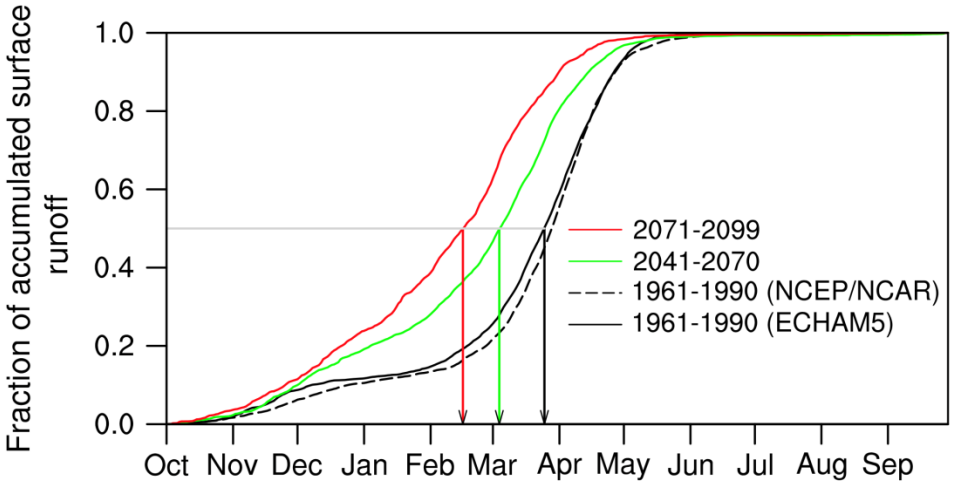
- Global climate change could place additional strains on the water resources in the ET basin.
- The IPCC has predicted gradually drier and warmer conditions in the Euphrates and Tigris basin during the 21st century, with earlier snowmelt in the Taurus and Zagros mountains, the basic water resource of the watershed.
- This emerging hydro-climate regime translates into decreasing snowfall and substantially increasing evaporation and transpiration losses in the watershed in the 21st century.

IPCC. (2007). "Contribution of working group I to the fourth assessment report of the intergovernmental panel on climate change." S. Solomon,et al., eds., Cambridge University, Cambridge, UK and New York.)

# Changes in Surface Runoff in the ET Basin

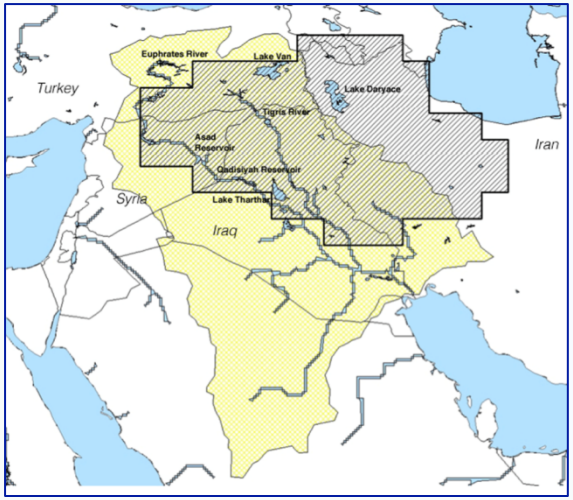


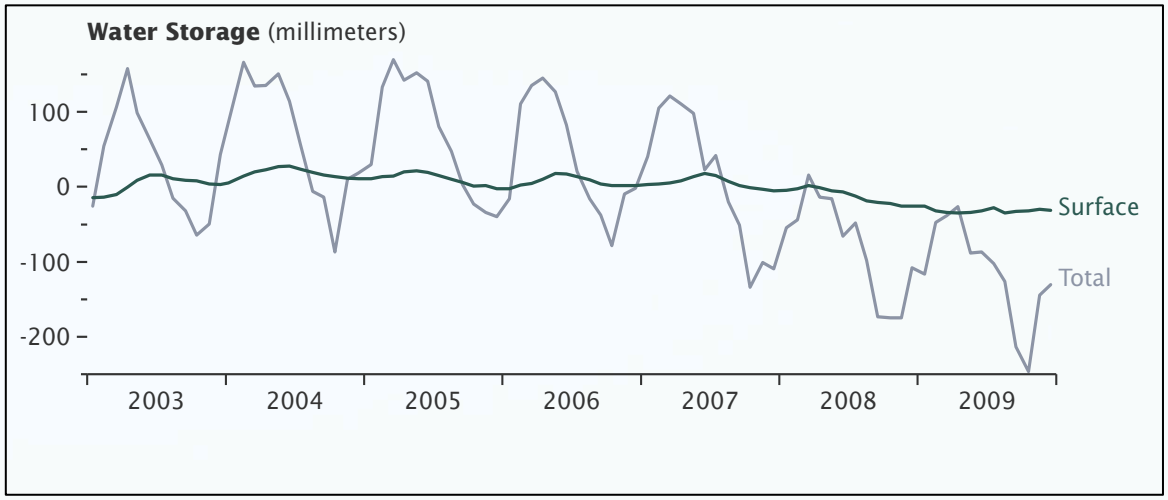



Based on different model and scenario simulations, the annual total surface runoff is found to decrease about 25–55% in the eastern Anatolian mountains (main headwaters of the basin) by the end of the 21st century.


Bozkurt, D. and O.L. Sen (2013). Climate change impacts in the Euphrates-Tigris Basin based on different model and scenario simulations. *Journal of Hydrology*, 480, 149-161.




Gravity Recovery and Climate Experiment (GRACE) satellite mission data indicate a total water volume loss of nearly 144 km3 over the 7-year period (2003-2009) studied. This loss is particularly alarming for regions such as the ET region, which is already facing severe water scarcity. The analyses presented suggest that groundwater depletion is the largest single contributor to the observed negative trend, accounting for approximately 60% of the total volume of water lost, the majority of which occurred after the onset of drought in 2007.

Voss, K. A., J. S. Famiglietti, M. Lo, C. de Linage, M. Rodell, and S. C. Swenson (2013), Groundwater depletion in the Middle East from GRACE with implications for transboundary water management in the Tigris-Euphrates-Western Iran region, Water Resour. Res., 49, doi: 10.1002/wrcr.20078.

# Emergence of Transboundary Water Dispute (in the mid 1960s)

## Competitive and uncoordinated water development (dams) projects

- Construction of the **Keban** (Turkey) and the **Tabqa** (Syria) Dams (1964-66)
- Construction of the **Karakaya** Dam (Turkey) (1976)
- Construction of the **Haditha** Dam (Iraq) (1977)

# ENDURED NEGOTIATIONS

- Unilateral moves by each party began to stress the river system's capacity.

- As the demand for water exceeded supply, water authorities in each country finally began reaching out to their counterparts in the others and they developed rather ad hoc processes of negotiation.

# Why were the negotiations unproductive?

- Rigid positions on water rights
- Disagreements over "subject" and "object" of the negotiations
- Claims on division/sharing of the Euphrates: zero-sum game
- The JTC did not provide a platform for delineating the co-riparians' priorities and needs as a basis for addressing regional water problems such as the negative impacts of climate change.
- National management and allocation policies were like "black boxes," and water management practices within the various countries simply could not be debated during those negotiations.

# WATER USE RULES IN THE REGION

- **The Protocol of 1987 Between Turkey and Syria:**

  *"Turkey commits to release at least 500 m3/sec at the Turkish-Syrian border. Turkey undertakes to release a yearly average of more than 500 m3/sec at the Turkish-Syrian border and in cases where the monthly flow falls below the level of 500 m3/sec, the Turkish side agrees to make up the difference during the following month"*

# WATER USE RULES IN THE REGION

- **The Protocol of 1990 Between Syria and Iraq:**

  *"58 percent of the Euphrates waters coming from Turkey would be released to Iraq by Syria."*

- However, the existence of these bilateral accords, both relating only to the Euphrates, could not be accepted as evidence of cooperation.
- The riparians could not agree on more comprehensive forms of cooperation that would adopt an integrated approach to the various aspects of water use and needs (quality, quantity, flood protection, preservation of ecosystems and prevention of accidents) and might potentially facilitate negotiations by linking water management issues.

- Most critically, both treaties failed to address fluctuations in flow, meaning that they contained no clauses referring to the periods of drought and flooding which frequently occur in the basin and cause drastic changes in the flow regime, requiring urgent adjustment to the use of the rivers.

# A WINDOW OF OPPORTUNITY OPENED: COOPERATION ON VARIOUS WATER RELATED MATTERS INCLUDING "CLIMATE CHANGE"

- HIGH LEVEL STRATEGIC COOPERATION COUNCILS
- MINISTERS COOPERATIVE NETWORK
- TRAINING PROGRAMS
- NEW PROTOCOLS ON WATER

# High-Level Cooperation between the Riparians with a Benefit-Sharing Approach

- High Level Strategic Cooperation Councils (HSCC) were established between Turkey-Iraq and Turkey-Syria in 2009 whereby, “Joint cabinet” meetings, including the ministers of interior (**security** matters), trade, **energy**, transportation, **water**, health, education, culture, agriculture and **environment.**

# Ministers Cooperative Network

- Minister of Water Resources-Iraq,
- Minister of Irrigation-Syria,
- Minister of Environment and Forestry-Turkey met at various occasions since 2007 to hold technical negotiations on water.

Major driving forces behind this cooperation have been the political will at the highest level as well as other urgencies **such as the prolonged drought (climate change) in the region**; water scarcity and water quality deterioration.

# Training Programs (since 2007)

**Technical experts from the three countries have been meeting to exchange information and know-how since 2007.**

- The first one was about modern irrigation systems and their implementation.
- The second one was about dam construction and safety.
- **There has also been demand for exchange of information on climate change and its effects.**
- A training facility in İstanbul

is dedicated to host technical experts from these

three countries for more educational

activities on that issue.

# Memoranda of Understandings

- Among the 48 Memoranda of Understanding which were signed between Turkey and Iraq on October 15, 2009, one was on "water."
- On December 23 and 24, 2009 Turkey and Syria signed at the first meeting of the High Level Strategic Cooperation Council in Damascus, 50 agreements, MoUs and cooperation including four MoUs related to water:
  - The Joint Friendship Dam on the Asi/Orontes river
  - Syrian water withdrawals from the Tigris
  - Coping with the Drought
  - Remediation of the Water Quality

# Climate Change Became A Significant Issue Of Transboundary Water Agreements

- The protocols signed by Turkey-Iraq and Turkey-Syria cover issues that have only recently come to the agenda of transboundary water negotiations among the technocrats and diplomats concerned.
- In this respect, it is interesting to note that this was the first official agreement concluded by the two countries on the protection of the environment, water quality management, water efficiency, **drought management, and flood protection with a view toward addressing the adverse effects of climate change.**
- Unlike the bilateral protocol concluded in 1987 on sharing the waters of the Euphrates, these protocols focused on how the riparian states were to use, manage, protect, and develop the diminishing water resources of the Euphrates and the Tigris rivers.

# Climate change: MoUs v. water sharing agreements

- Past water-sharing agreements have not been designed considering future variability and are not flexible enough to deal with human-induced climatic changes and hydrological realities.
- The recent Memoranda of Understandings signed between Turkey-Syria and Turkey Iraq in 2009 incorporated clauses on cooperation modalities of studying the impacts of climate change as well as coping with and managing droughts in the region.

# Climate Change: "Common Problem"

- **Hence, "climate change" has been perceived as both a "common threat" and "common problem," and has become less contentious than water sharing**

and, in fact,

- **Provided an avenue for initiating cooperation around a series of training programs and planned joint projects in the first decade of the 2000s.**

# Climate change and water security

- Water security (access to clean and enough water and sanitation) in the Euphrates-Tigris region is in jeopardy due to human-induced climatic changes (prolonged droughts) as well as growing political instability and conflict in Syria and Iraq.

**Some social scientists, policy makers and others have previously suggested that the drought played a role (catalytic effect) in the Syrian unrest.**

# Are droughts (or floods) the major reason of conflict?

- Extreme dryness, combined with other factors, including misguided agricultural and water-use policies of the Syrian government, caused crop failures that led to the migration of as many as 1.5 million people from rural to urban areas. This in turn added to social stresses that eventually resulted in the uprising against President Bashar al-Assad in March 2011.

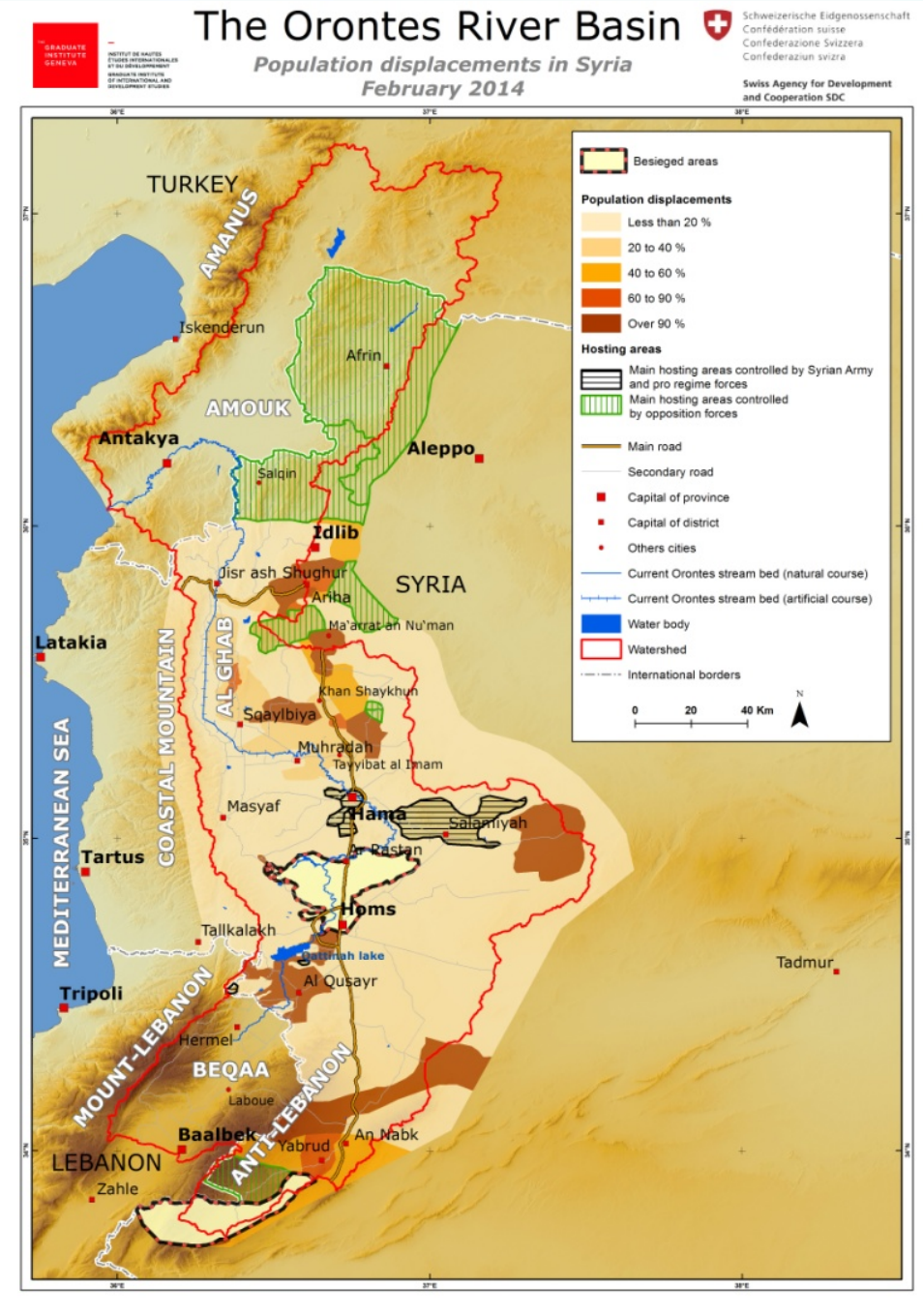
- However, principal sources of hot conflicts are contextual:
  - political
  - social
  - economic

# Project entitled "Water security in the Middle East, Orontes River Basin" undertaken by Geneva Graduate Institute and SDC (MEF University joined in the second phase)

- The project basically aims to analyze the impact of Syrian civil war on population displacements, drinking water availability, domestic and agricultural water infrastructures, and agriculture in the Orontes River basin in Syria which is a key region in the conflict and comprises some of the most conflict-affected urban and rural areas in the country.

# Population Displaced

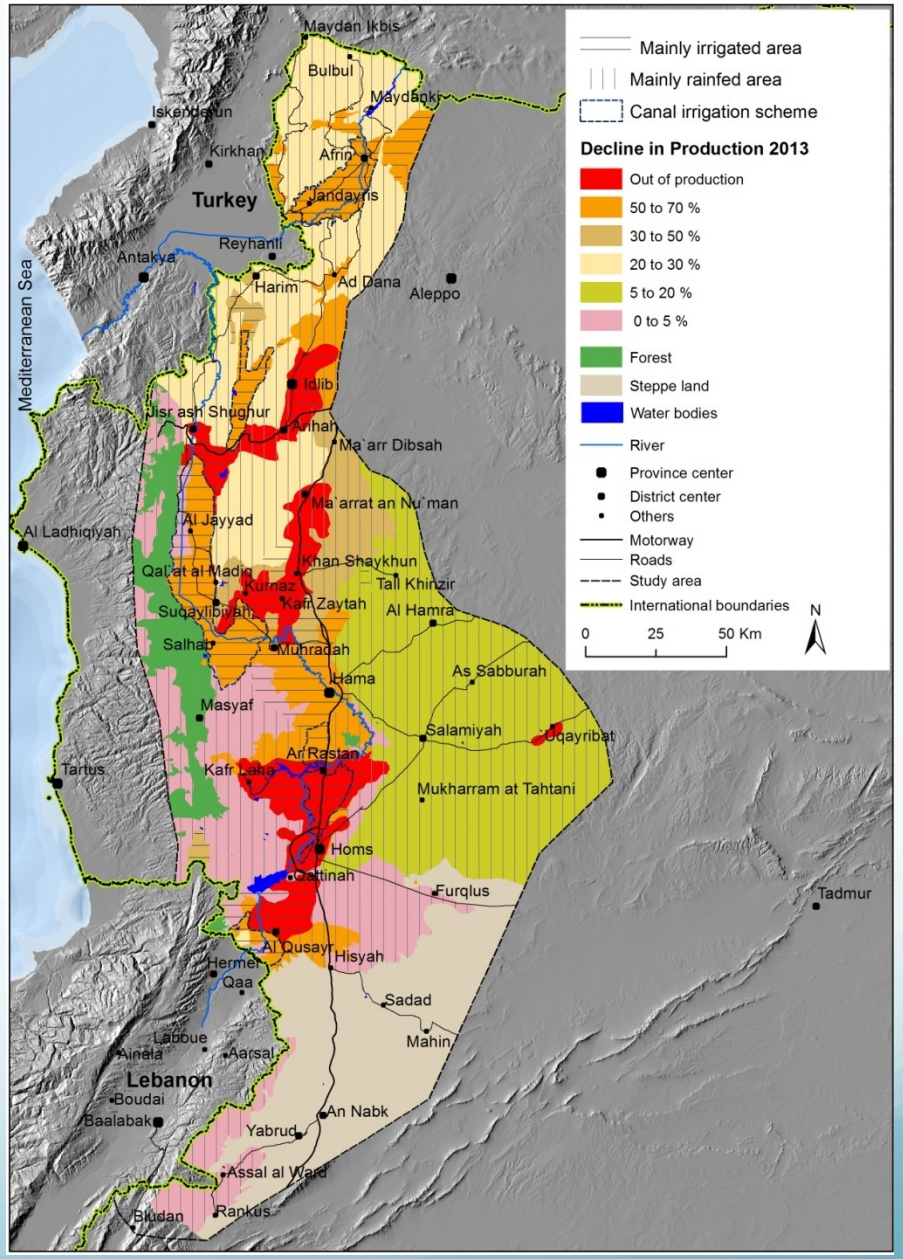
Three quarters of population of Orontes basin have been displaced during the past four years.



# Agriculture declined

Water for food is also important, crop production shrunk by over 70% largely because of the sharp decline in irrigated land. Irrigated areas shrunk more than half in the entire basin.

Part of the water infrastructure was destroyed during the fighting by bombing and passage of military vehicles, but the water-supply has often been deliberately cut by disconnecting the supply to the channels and by plugging wells.

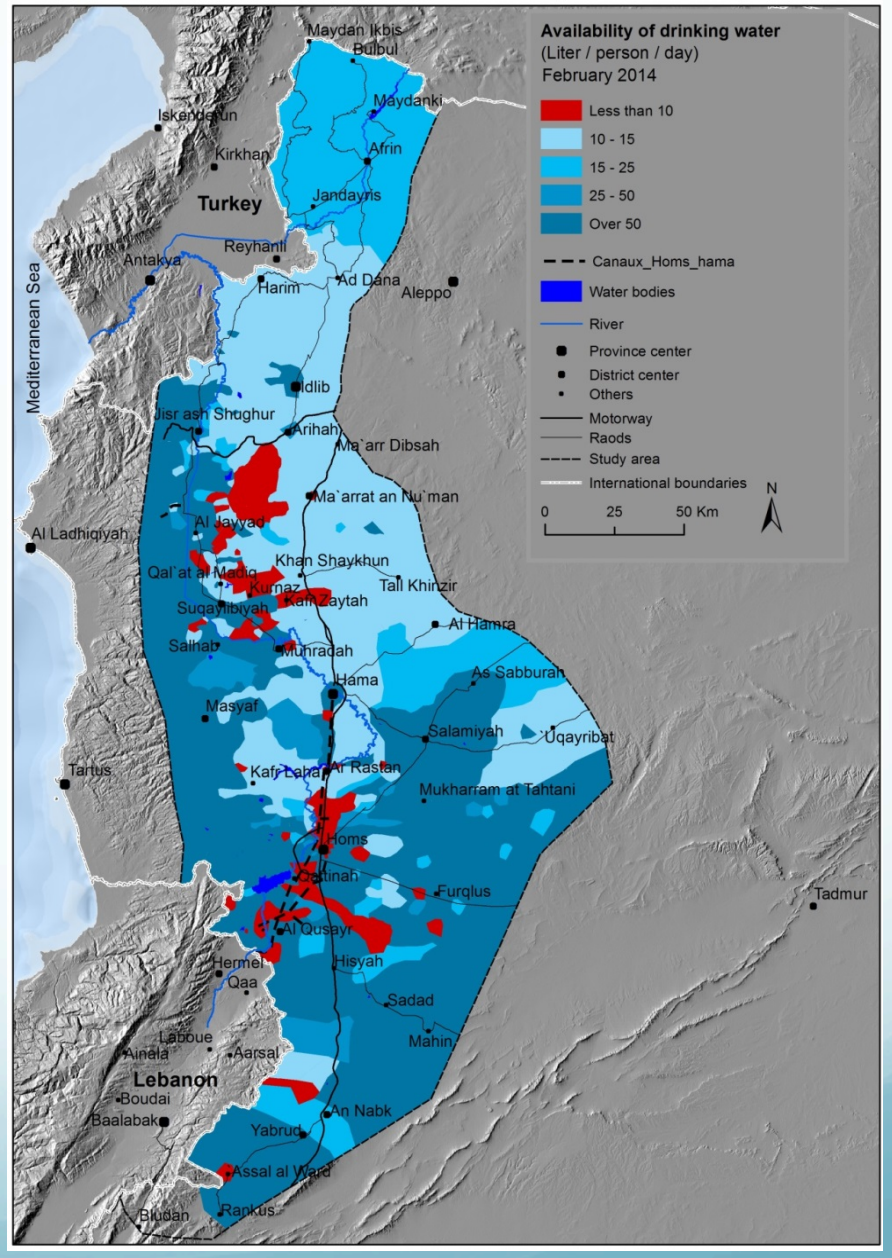


# Drinking Water

Access to safe drinking water is currently critical for 2.5 million people in large parts of the Orontes basin which has led to a sharp increase in waterborne diseases.

Power cuts and damage to pumping stations are the main causes of drinking water shortages. Public water networks in rural areas are dependent on power supply which is severely affected by the conflict.

Areas under the control of pro-regime forces are however generally better served than those under the control of opposition forces.



- The Orontes River basin is a key region in the ongoing conflict and will remain so during the post-conflict transition period.
- There is an immediate need to improve drinking water supply and to support agriculture in areas less affected by the fighting. From a post conflict perspective, rehabilitation of the domestic and agricultural water infrastructure will be a priority to ensure the sustainable return of displaced populations. Beyond emergency relief interventions, the prioritization and allocation of resources for reconstruction will be determinant factors in the reconciliation process.