Dissecting the Lake Urmia Disaster

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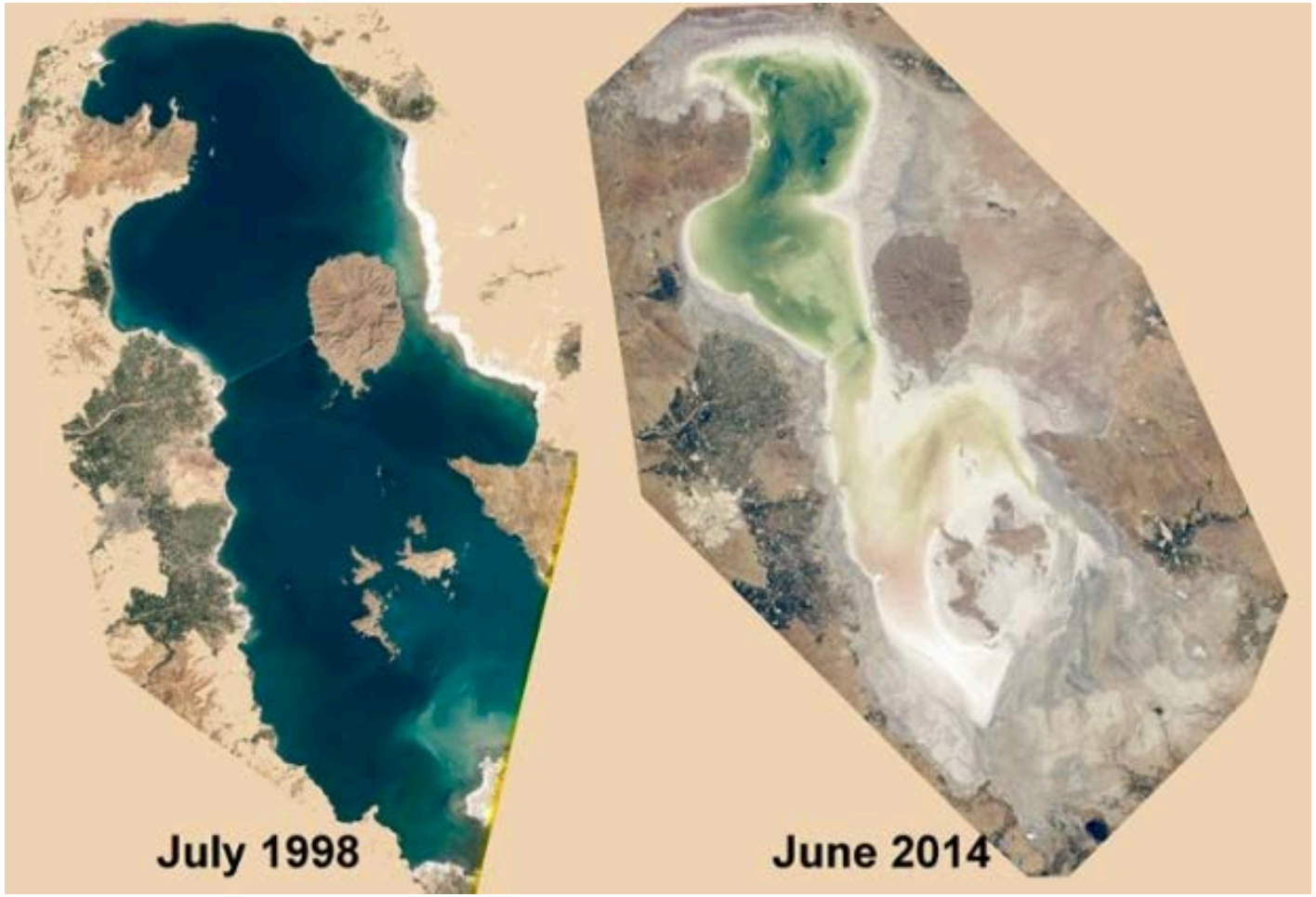
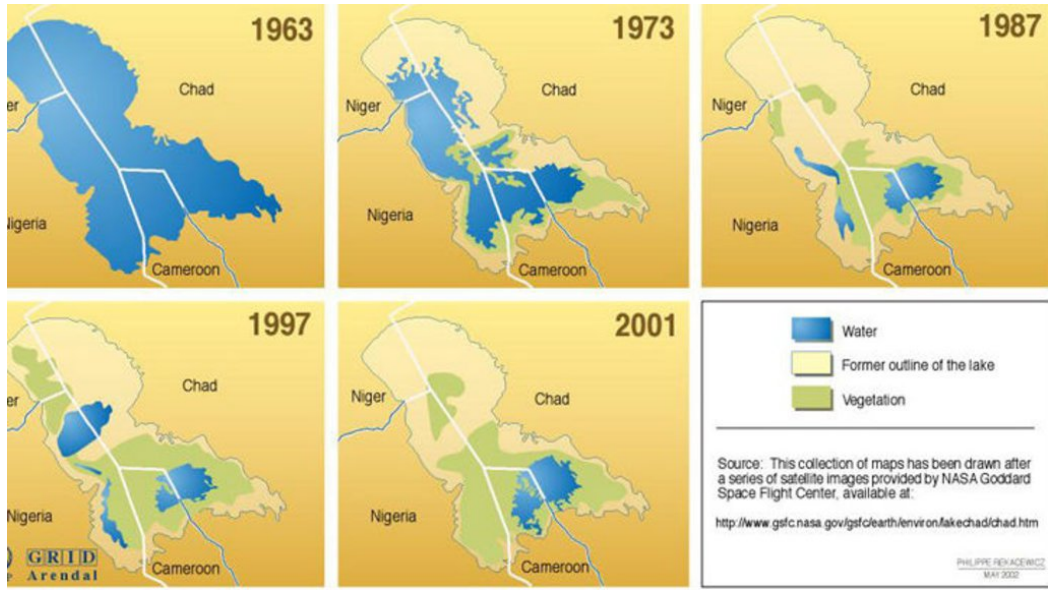
2019 OCLWA Conference, April 3rd, Stillwater, OK

Problem: Lake Urmia Shrinkage



Is this only happening to Lake Urmia?

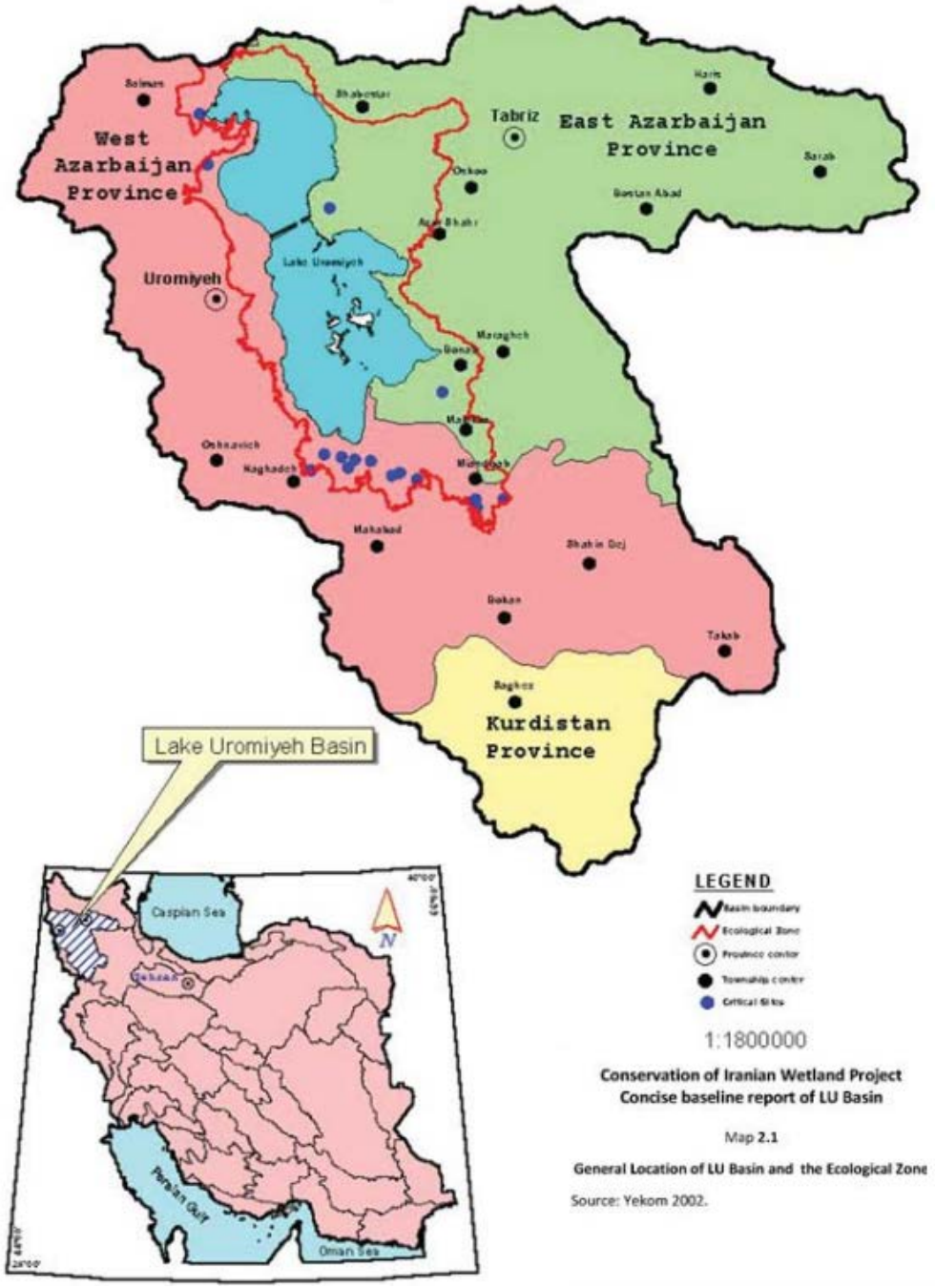
- Mono Lake, CA
- Owens Lake, CA
- Salton Sea, CA
- Great Salt Lake, UT
- Aral Sea, Central Asia
- Lake Chad, Africa



(a) 1960 (b) 1990 (c) 2008

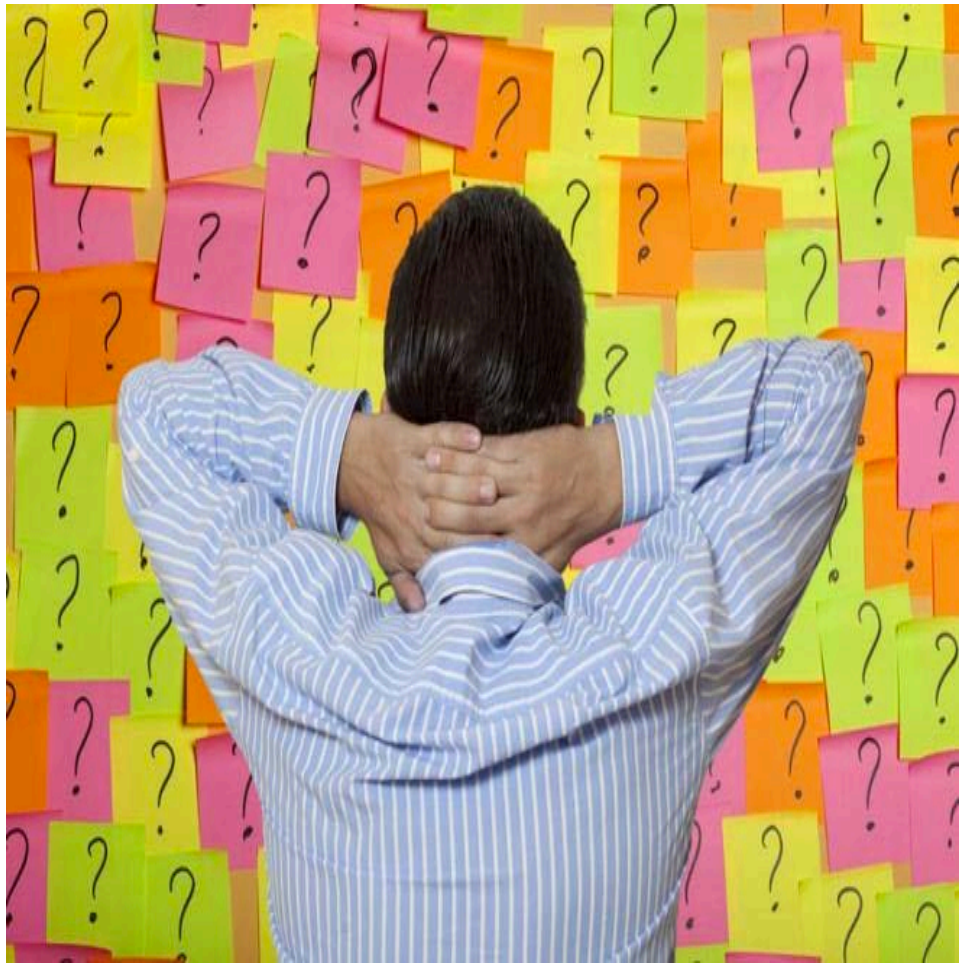
Lake Urmia

- Over 2000 mi^2
- Located in northwestern Iran
- One of the world's largest salt lakes
- UNESCO biosphere reserve



Cause

- Droughts?
- Climate change?
- Dams?
- Natural cycle?
- Upstream water use?
- Land use changes?
- Groundwater mining?
- ……
- All of the above?



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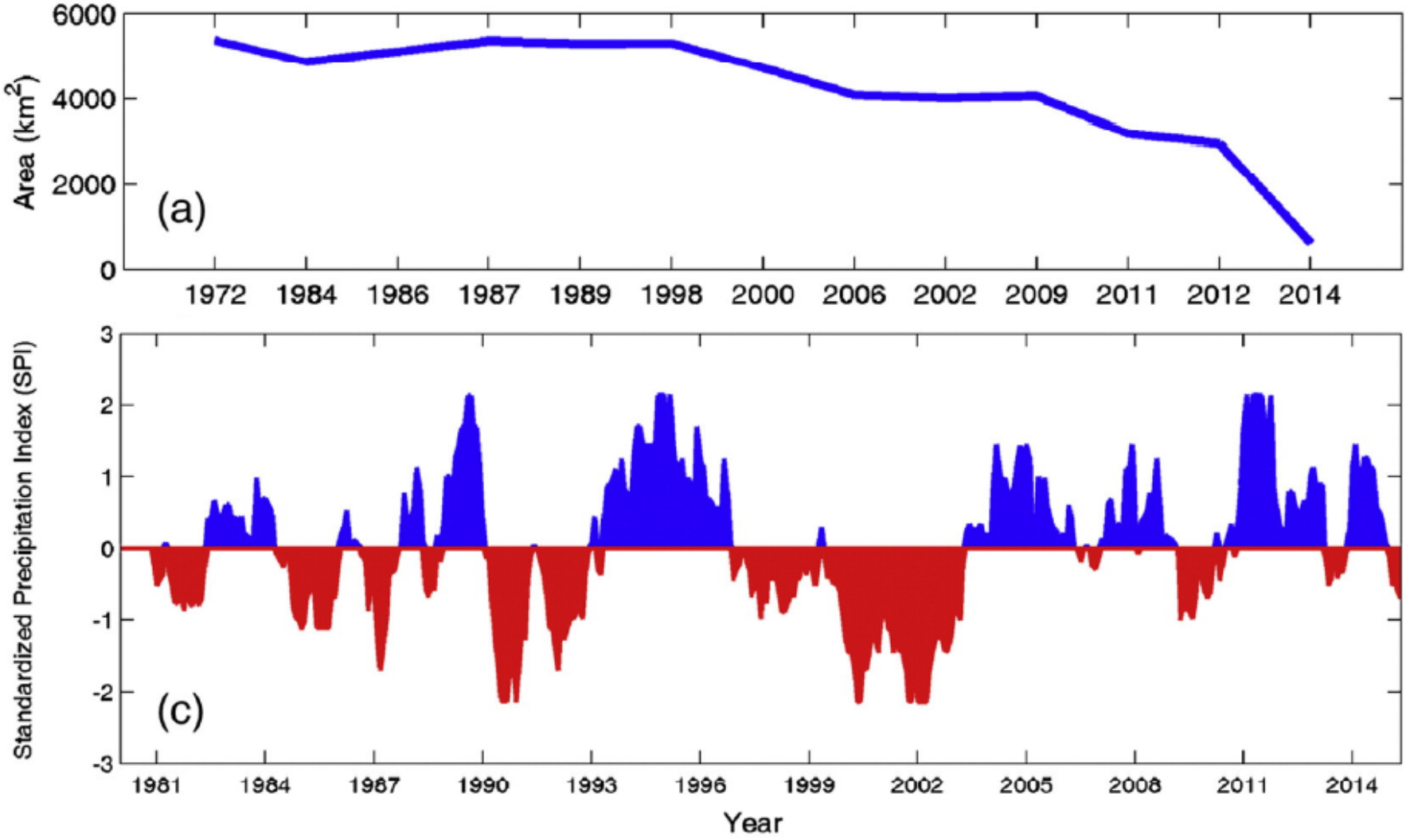

AghaKouchak et al. (2015)

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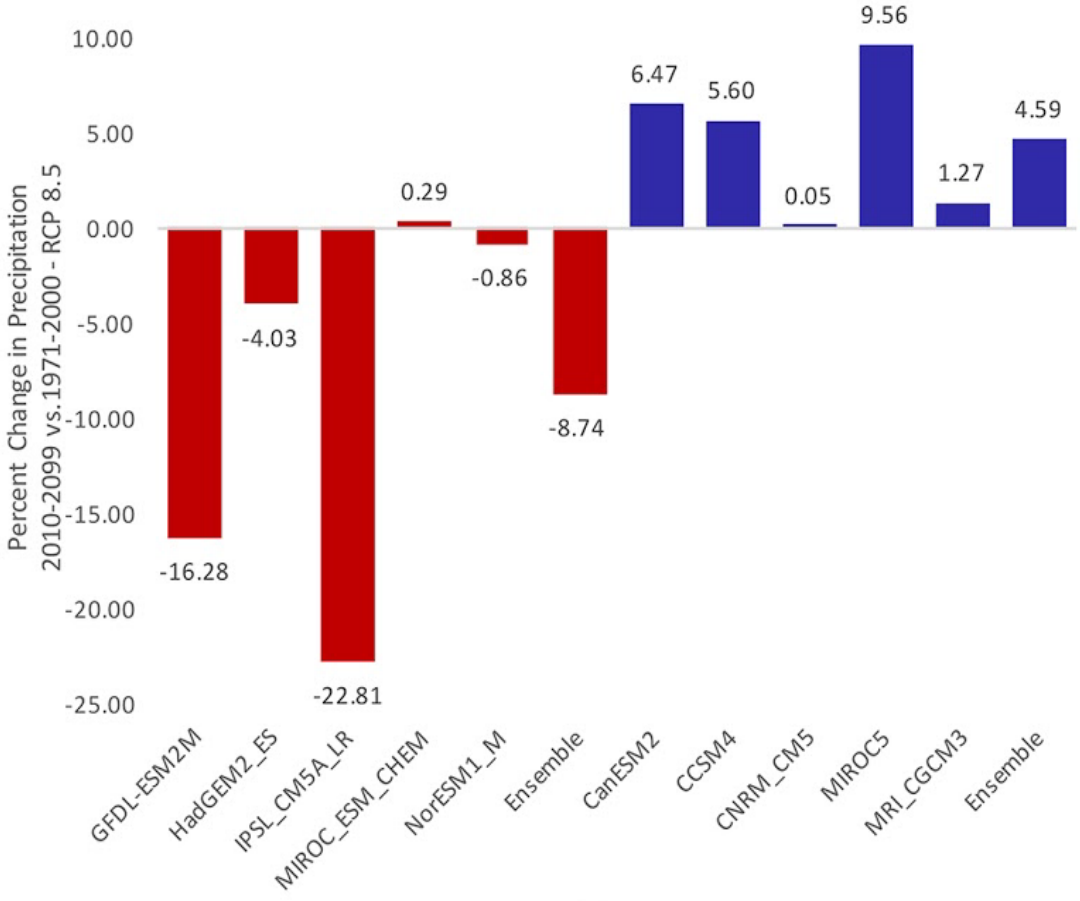

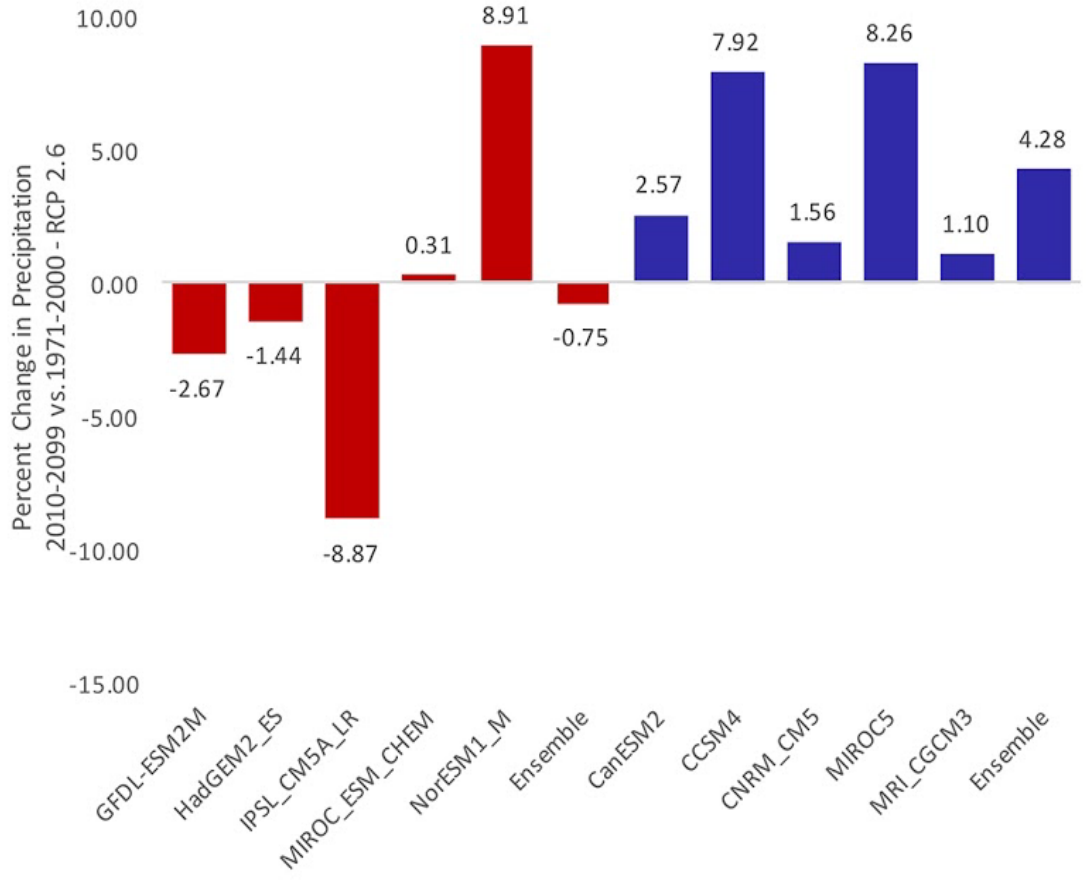

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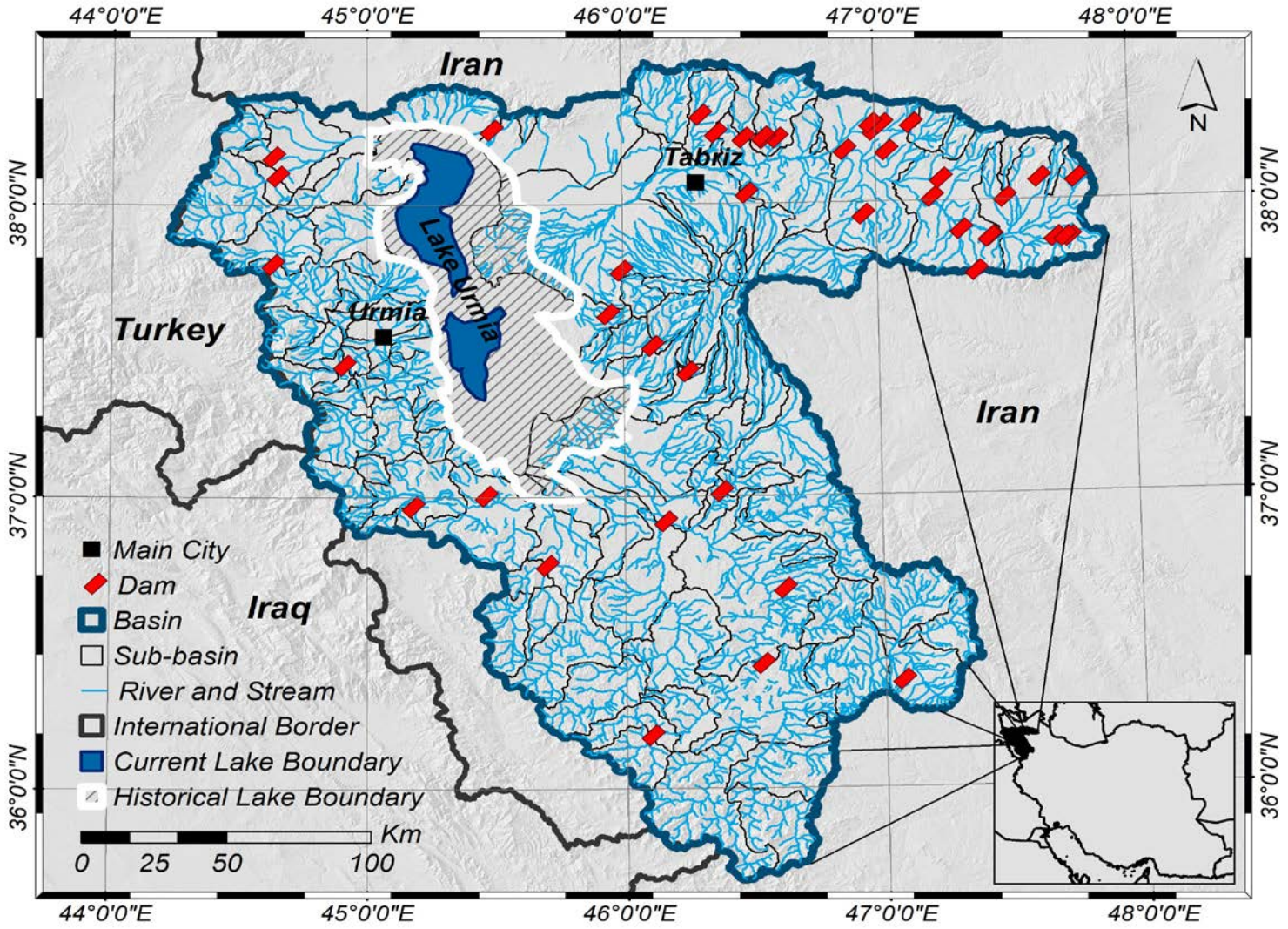

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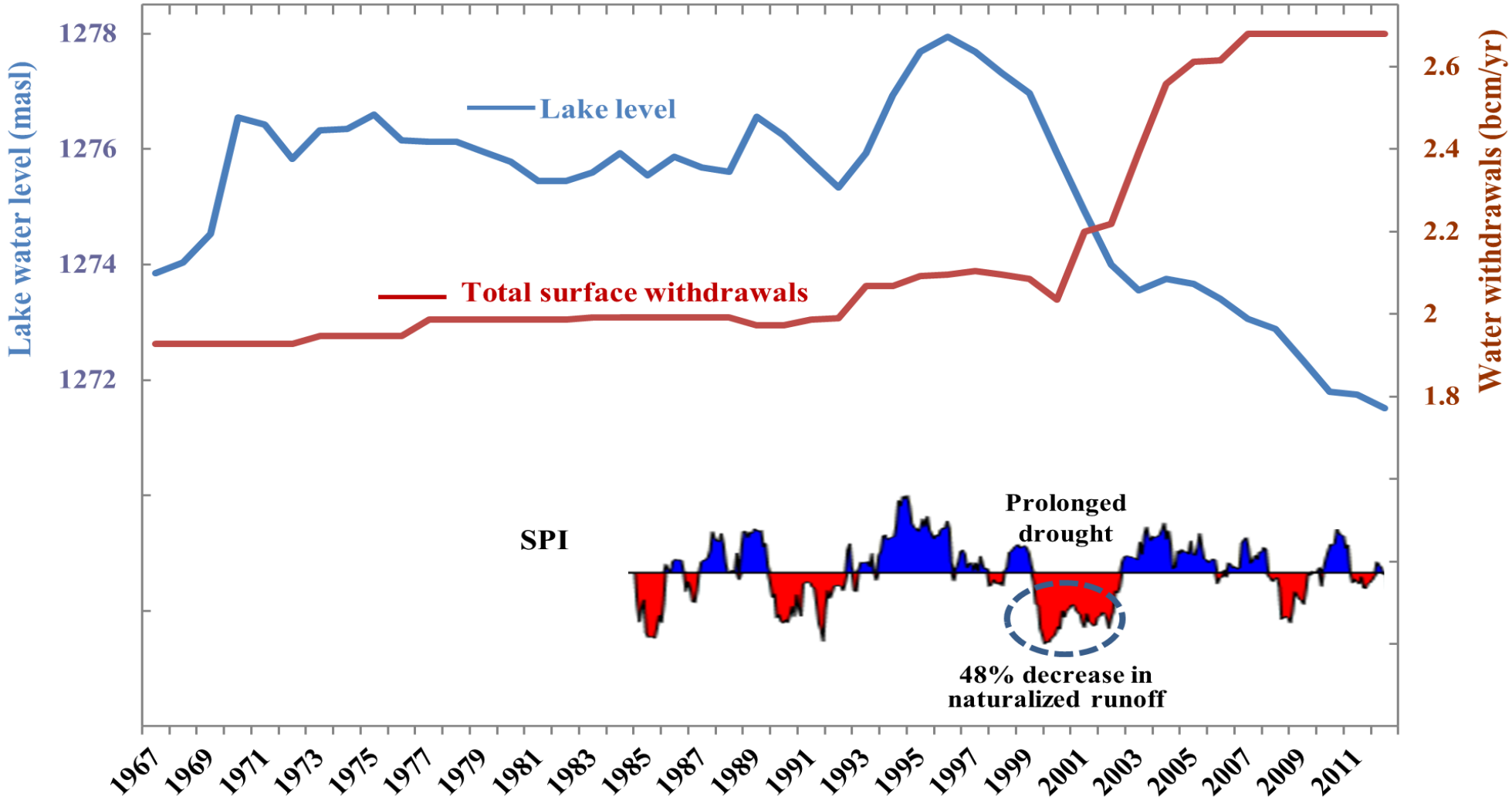
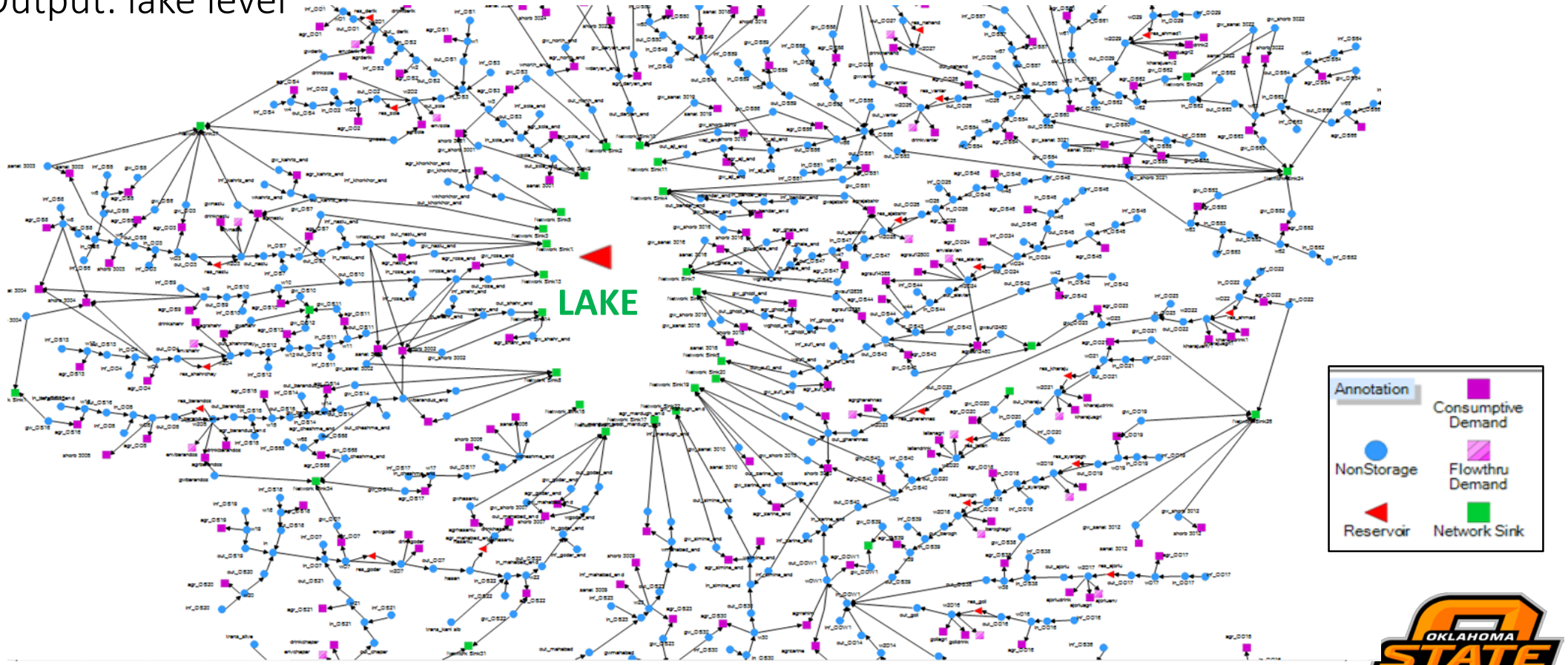


Simulation: Urmia Basin and Lake interaction

- ✓ MODSIM: decision support system
- ✓ All agricultural and municipal withdrawals, Dams operations
- ✓ Lake evaporation
- ✓ Output: lake level

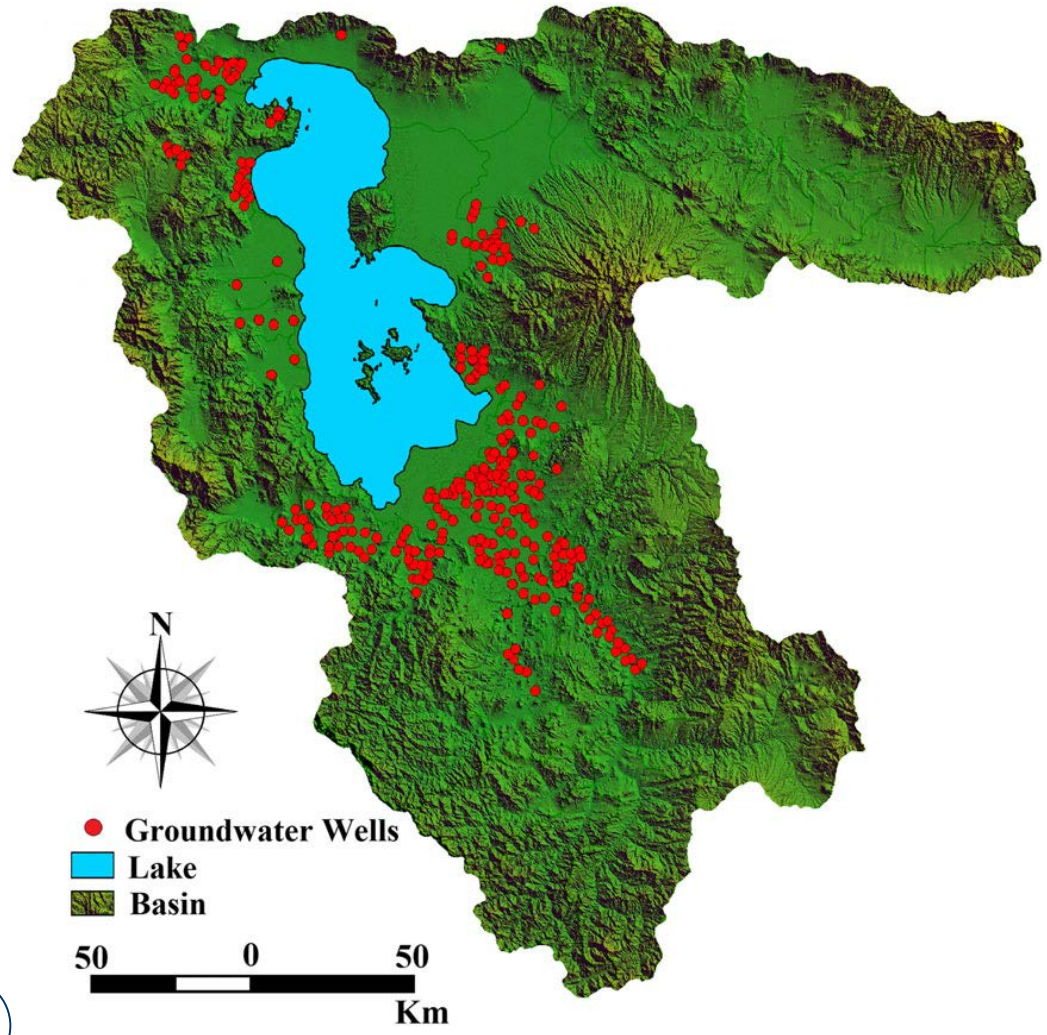
✓ **117 Sub-basins** ✓ **17 Dams**

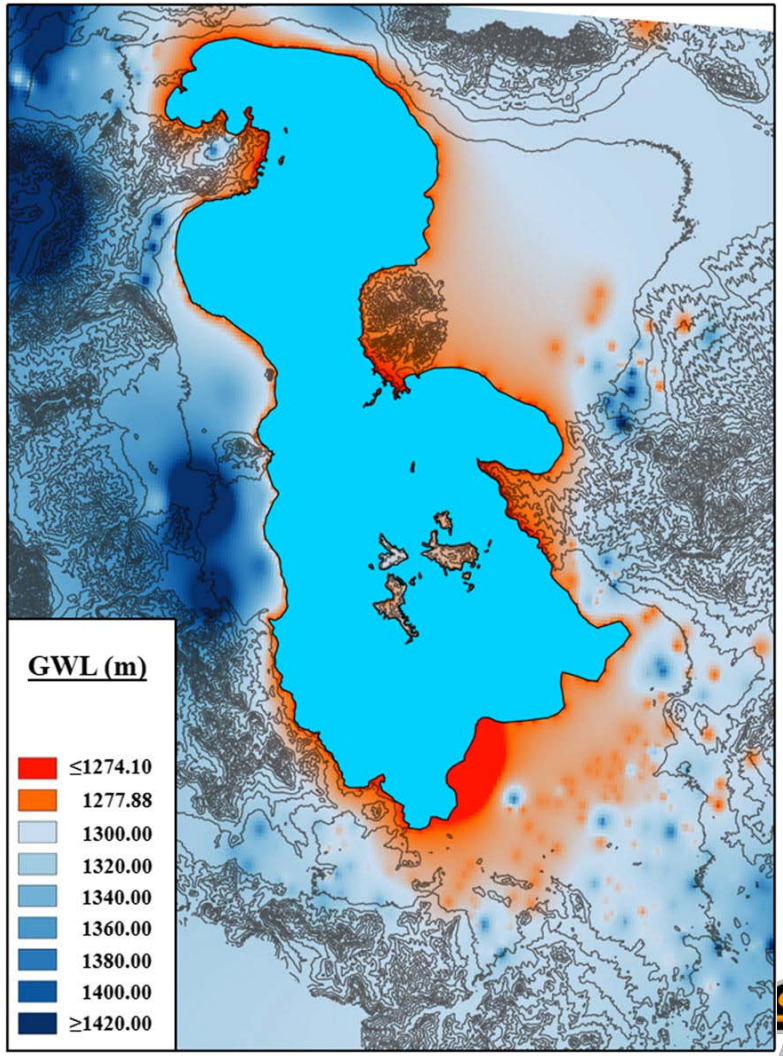


✓ Unique basin with a lot of human activities and we take those into account

Groundwater Withdrawal

Vaheddoost and Aksoy (2018)





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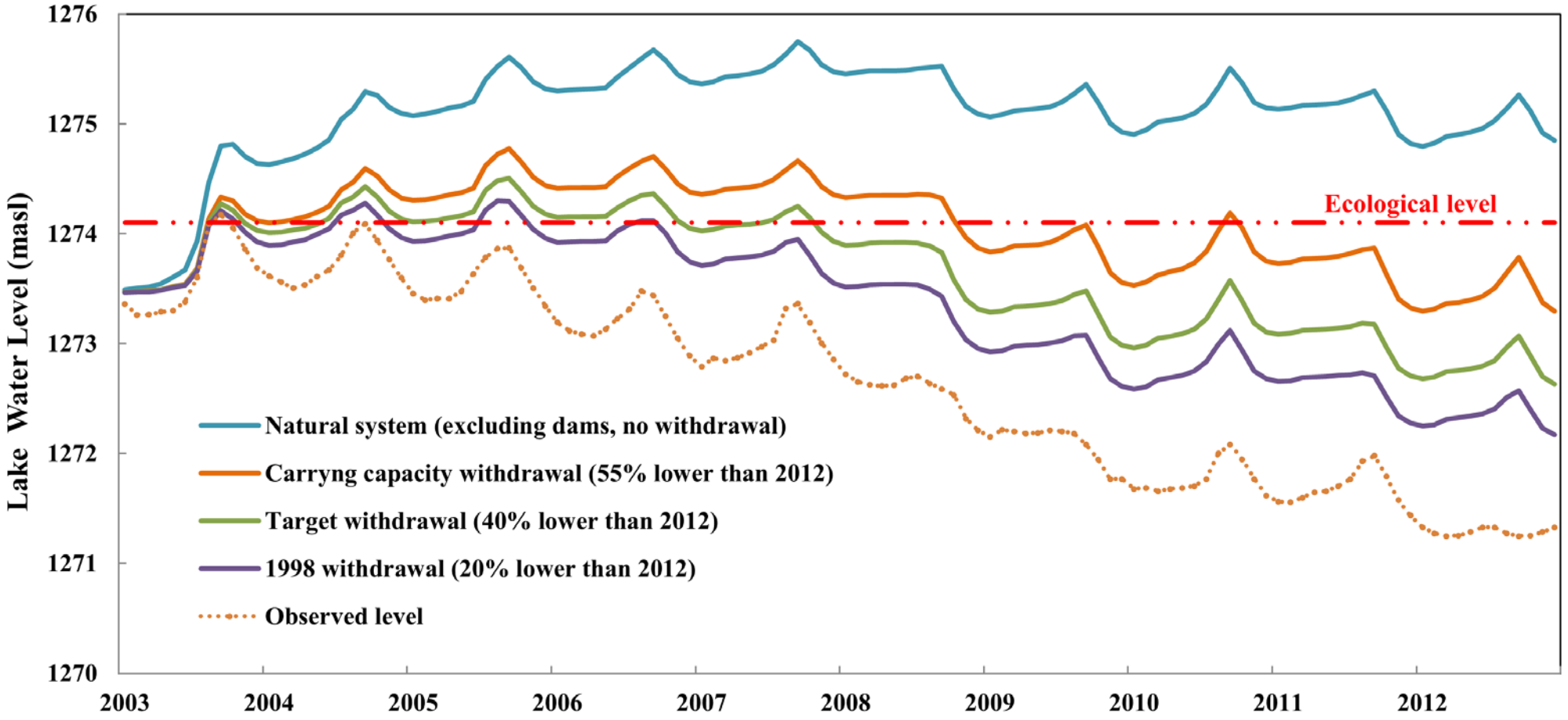
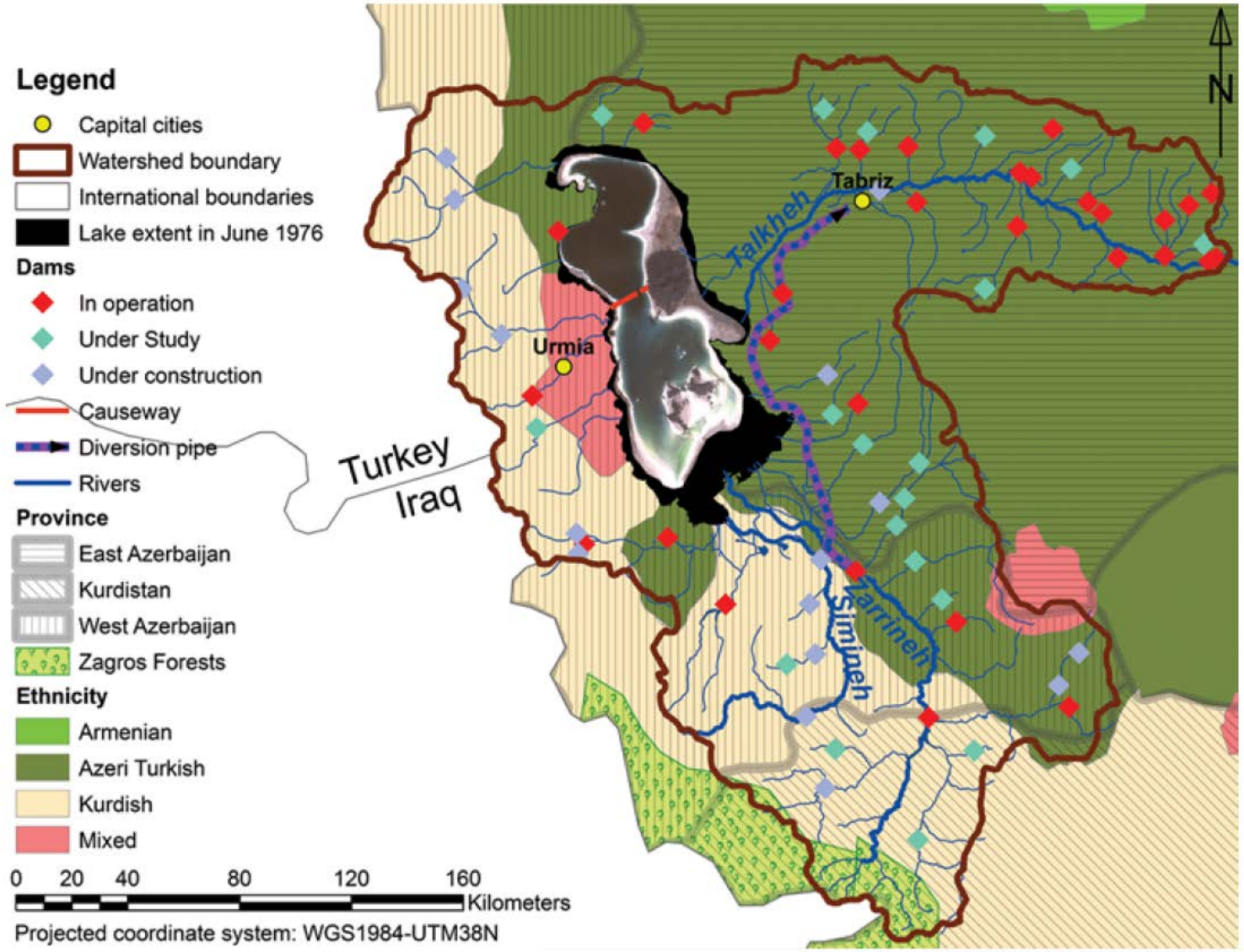
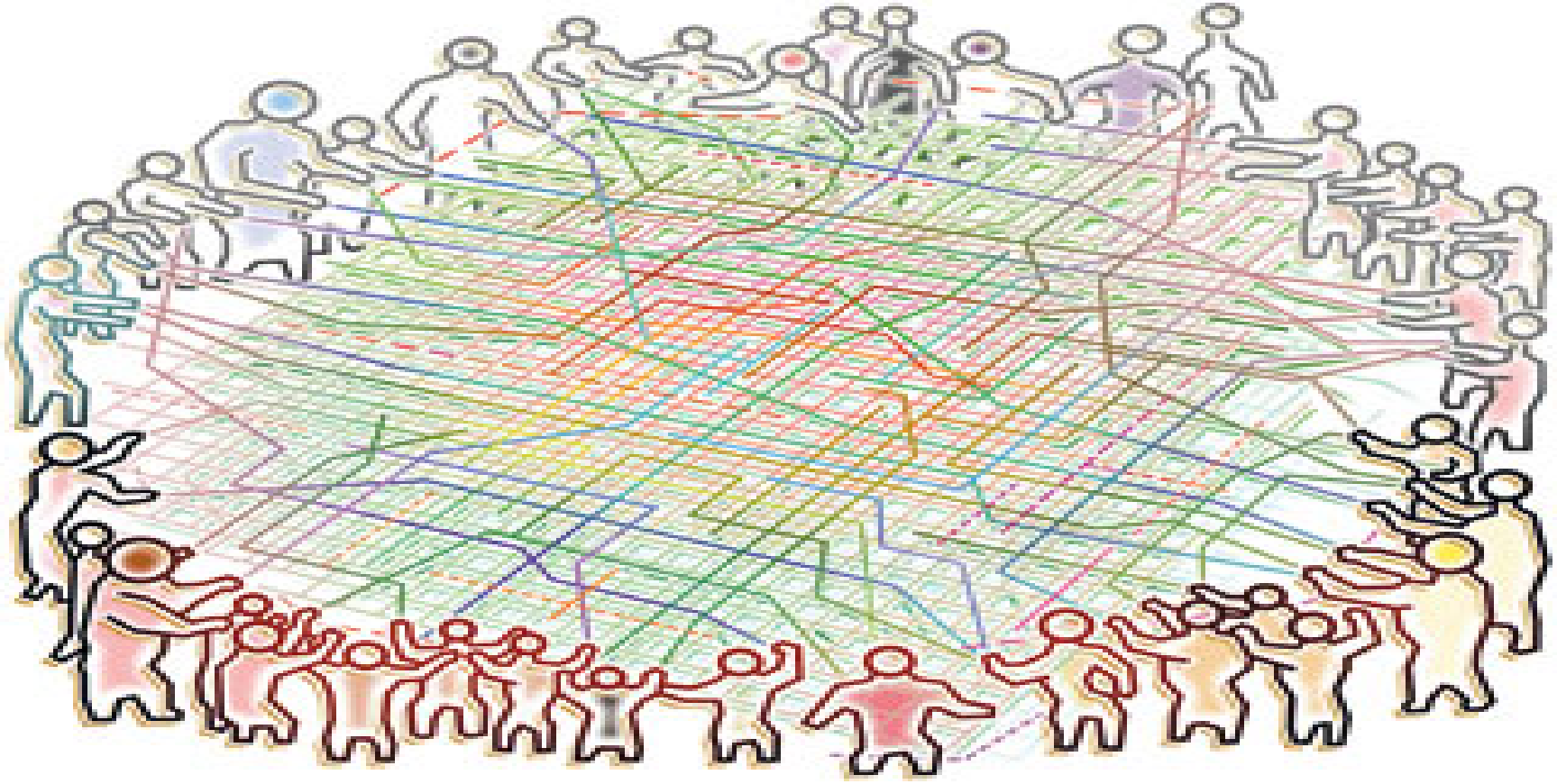


Who manages the Lake Urmia Basin?

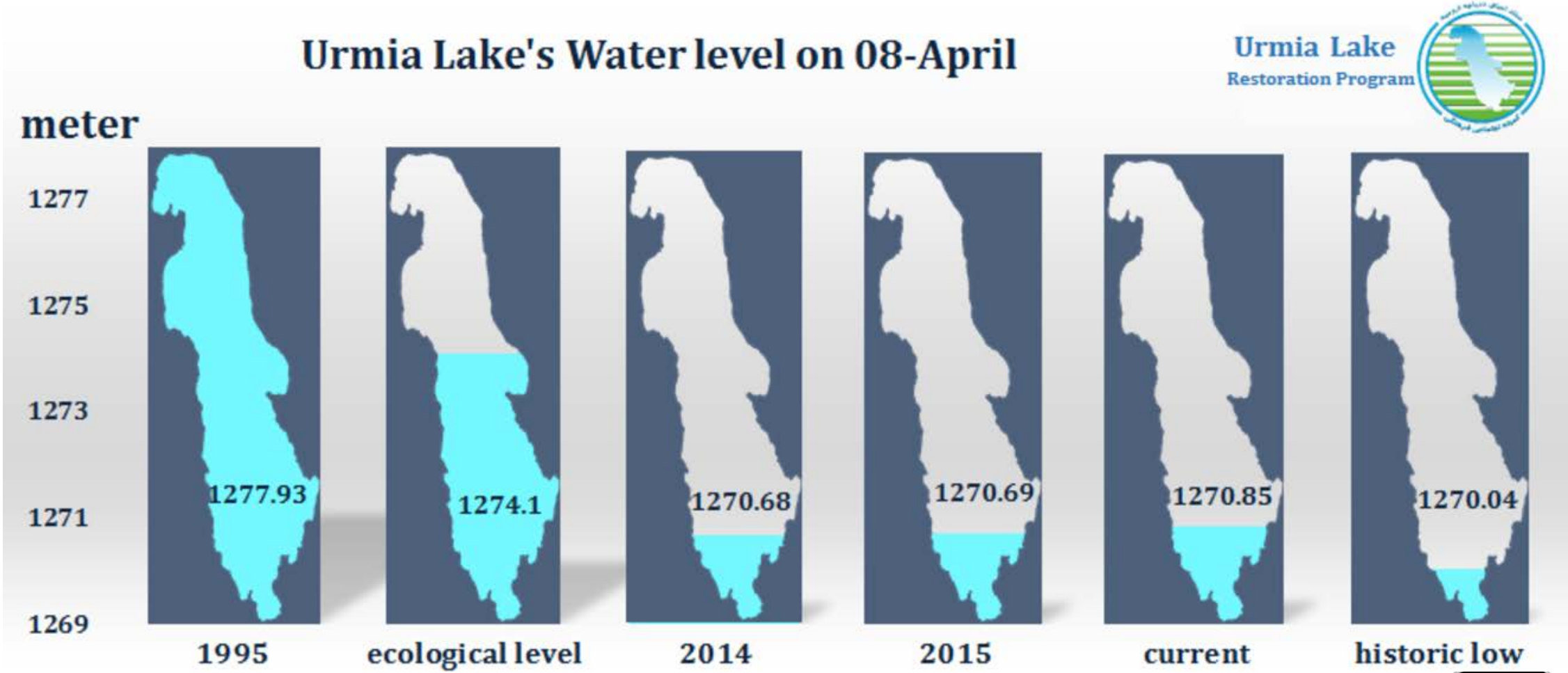


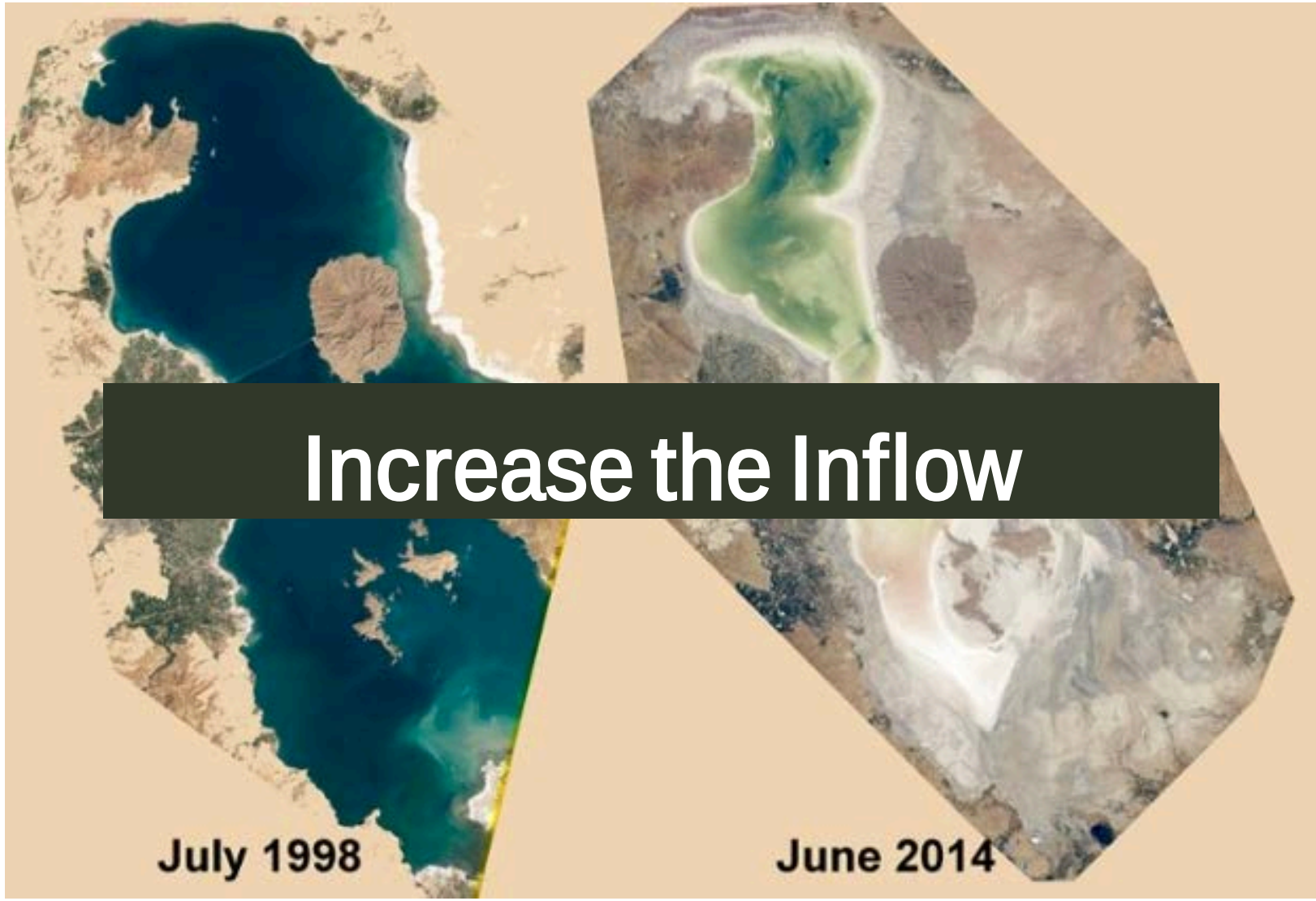
Henareh et al. (2014)

Tragedy of the Commons



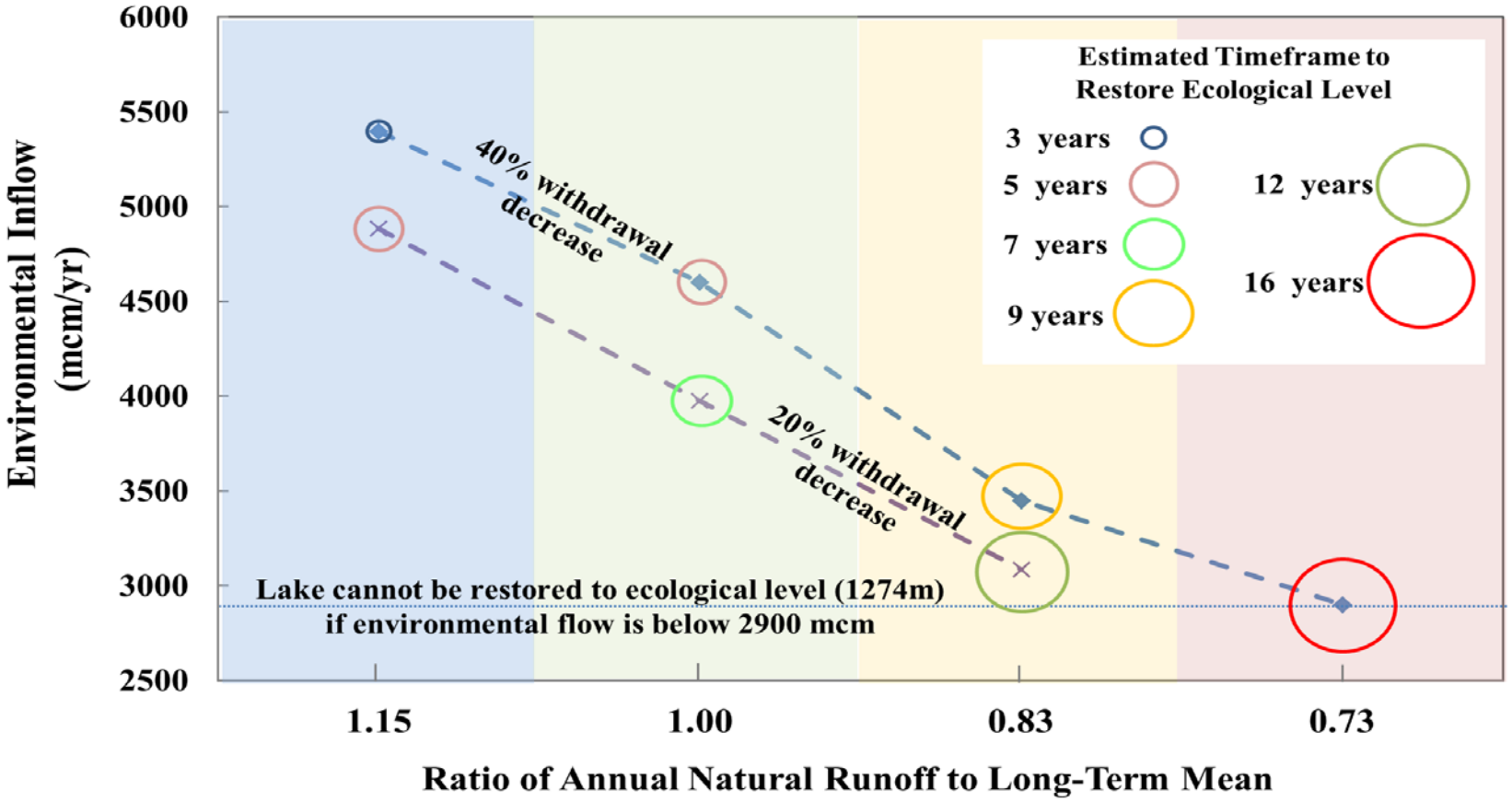
Current Status

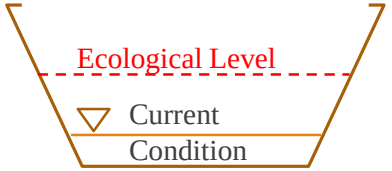



Increase the Inflow
July 1998
June 2014

Environmental inflow and timeframe to restore to ecological level

- Estimating inflow needed to reach the ecological level (1274 masl).
- Water withdrawal reduction enforcement: 40% decrease.

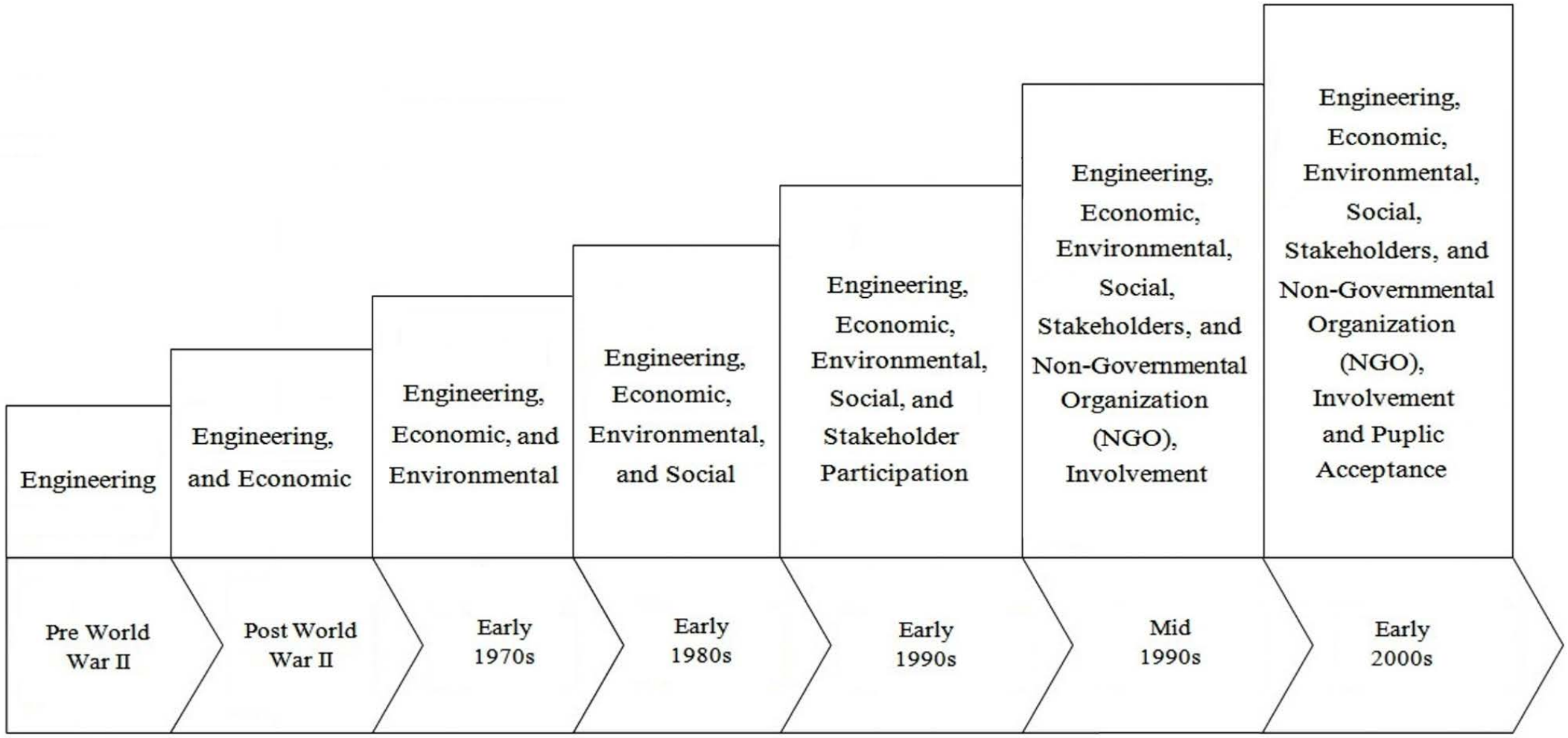




Alborzi et al. (2018)

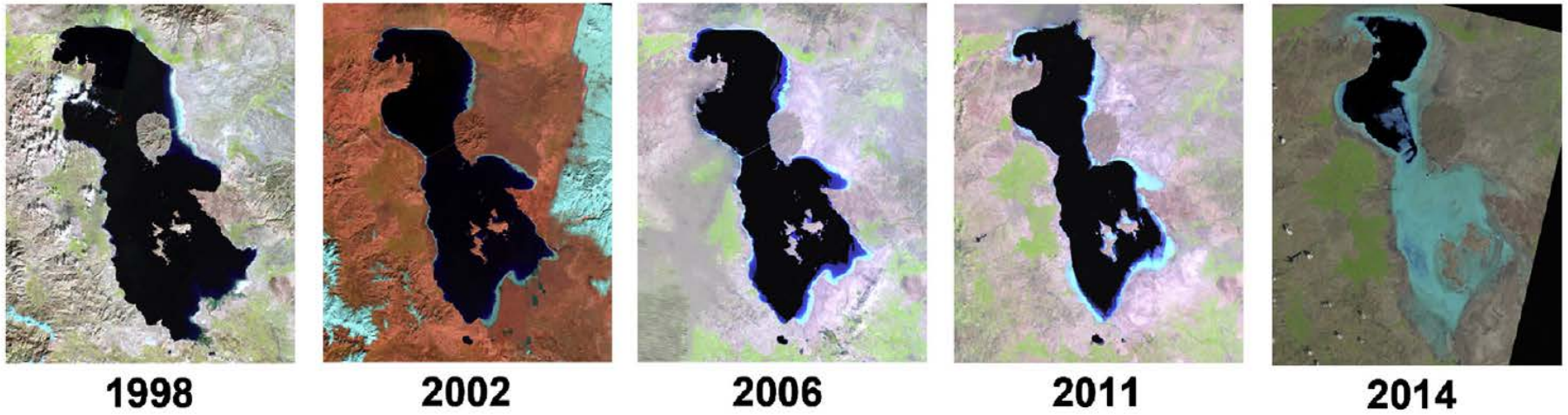
- Recovery will take 7 to 16 years, depending on climatic conditions.
- Right now, the lake inflow is less than 2000 mcm.
- We offer on average a higher inflow than the previous studies did.

Need Water Management Paradigm Shift



Public Outreach and Awareness

AghaKouchak et al. (2015)



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Ali Mirchi, Kaveh Madani and Amir AghaKouchak

Friday 23 January 2015 07.54 EST

Lake Urmia: how Iran's most famous lake is disappearing

New research shows Iran's most famous lake has shrunk by nearly 90% since the 1970s. Scientists urge action

Summary

- Lake Urmia is on the brink of an environmental catastrophe similar to what happened in the Aral Sea Basin
- The problem is caused by a combination of anthropogenic effects and dry conditions
- Multitude of players and stakeholders makes restoration a difficult process
- Efforts are underway and there's consensus to increase the lake's inflow
- Restoration timeline is ambitious and requires stakeholder buy-in and engagement

Acknowledgement

Thank you!

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