



# Groundwater Resources Management in IRAN

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## Abstract

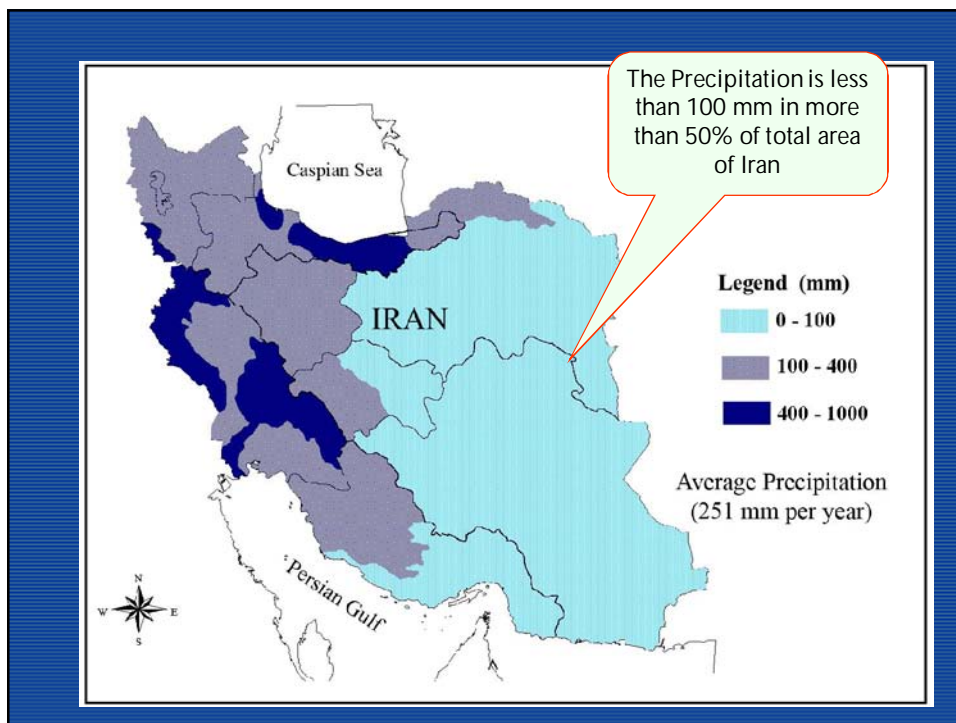
Iran is one of the arid & semi-arid countries of the world with average precipitation of 251 mm/year. The total renewable water resources of Iran is 130 Billion Cubic Meters (BCM), out of which 92% is used for agriculture, 6% for domestic use and services & 2% for industrial uses. At present, a total of 786,478 structures (springs, qanats and wells) provide 79,196 MCM of ground water. Rapid population growth and low irrigation efficiency in agricultural sector have increased the demand for groundwater resources. Therefore, rational management for water supply and demand and optimum use of the available water resources is necessary. The paper deliberates on the factors responsible for the groundwater resources crisis, negative effects due to groundwater drawdown, challenges of protection and management of groundwater resources, perspectives required and the recommendations made by the Iran Water Resources Management Company to overcome the crisis. The paper recommends ground water management through improved water efficiency, increasing storage capacity, water harvesting, recycling and desalination. It also emphasizes comprehensive water law, capacity building, establishing Water User Associations etc.

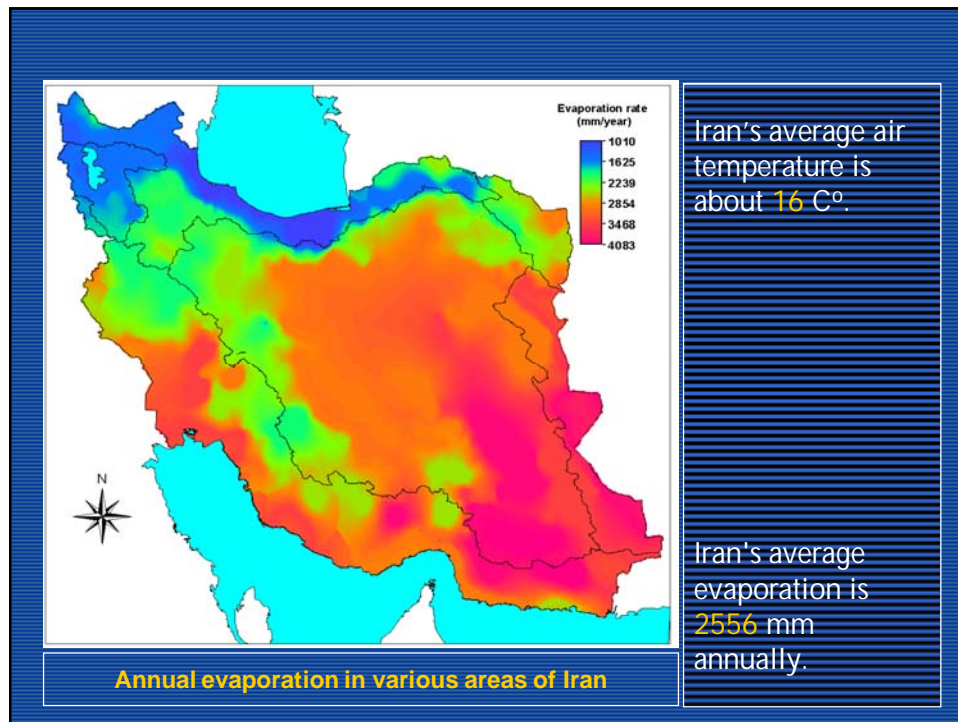


## Islamic Republic of Iran



- ◆ **Population:** 70 million (*18<sup>th</sup> in the world*);
- ◆ **Area:** 165 Mha (*18<sup>th</sup> in the world*);
- ◆ **Climate:** Arid & semi-arid;
- ◆ **Precipitation:** 250mm annually;
- ◆ **Irrigated Area:** 8.7 million ha; World ranking the fifth after China, India, USA, and Pakistan,





### Climate/Water Resources

- ① *Having insufficient and improper locational, as well as, periodical precipitation, Iran is among the arid & semi-arid countries of the world.*
- ② *According to the water comprehensive plan of Iran the total renewable water resources reaches 130 billion cubic meters.*

*About 90 billion cubic meter of the total renewable water resources is used for agricultural, industrial, and domestic sectors as follows:*

- *83 billion cubic meters, that is 92 percent for agriculture;*
- *6 billion cubic meters, that is 6.6 percent for domestic;*
- *The rest for industry and services.*

Groundwater plays an important role in sustainable development of human society. In IRAN, rapid population growth and low irrigation efficiency in agricultural sector have increased the demand for groundwater resources. Therefore, rational management for water supply and demand, as well as, optimum use of the existing water resources are necessary.

## How We Can Prepare More Fresh Water in Future

- Improving Water efficiency
- Increasing Storage Capacity
- Maddening Water Harvesting Methods
- Recycling Water & Wastewater
- Desalination

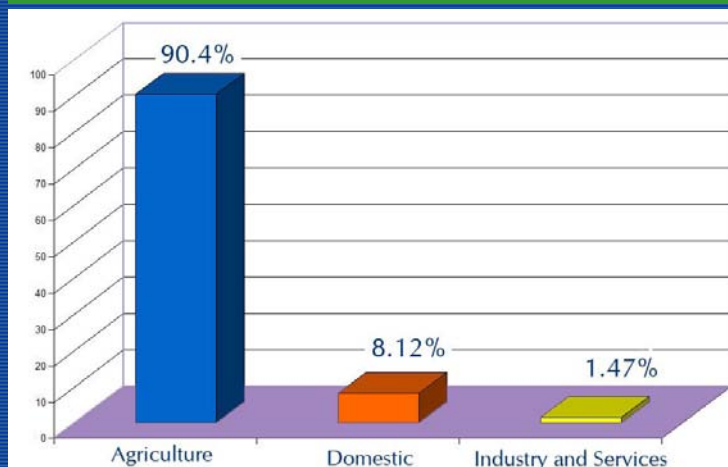
### Groundwater Aquifers Condition in Aspects of Exploitation Development

Subject	No. Plain
❖ Normal Prohibited Aquifers	203
❖ Critical Prohibited Aquifers	67
❖ Free Aquifers	339

### Number and Discharge of Groundwater Resources (Water Year 2006-2007)

Type of water resources	Number	Discharge (MCM)
Spring	124,443	22,914
Qanat	37,197	7,375
Well	624,838	48,907
Total	786,478	79,196

### Groundwater Resources used for:



### *Effective Factors on Increasing Groundwater Resources Crisis*

- 1- Drought (Decreased precipitation).*
- 2- Population growth and agricultural development.*
- 3- Excess Water withdrawal from permitted water wells.*
- 4- Water withdrawal from unpermitted water wells.*
- 5- Improper use of groundwater resources.*
- 6- Pollution through industrial activities and houses sewage.*
- 7- Limitations and difficulties in carrying out water rules and regulations.*

### Negative Effects Due to Groundwater Drawdown

- 1- Decreased water resources (Wells, Springs and Qanats).
- 2- Water wells deepening repeatedly.
- 3- Decreased natural water reservoirs.
- 4- Land subsidence (regional or local).
- 5- Saline Water intrusion to fresh groundwater.
- 6- Decreased of the groundwater quality.





*Iran*

Challenges on Protection and Exploitation of Groundwater Resources Management:

- 1- Negative balance of groundwater aquifers.
- 2- Incorrect use of groundwater resources.
- 3- Changes in quality related to groundwater drawdown.
- 4- Restricted current laws and regulations.
- 5- Cultural and social issues on groundwater protection.

### Perspectives:

1- Optimization of groundwater usage.

2- Equilibration of aquifers:

- Aquifers artificial recharge.
- Conjunctive use of surface and groundwater for irrigation.
- Establishing underground dams.
- Locking water wells which are not permitted.
- Organizing lawful companies for drilling water wells.
- Monitoring and controlling of water withdrawal.
- Increasing public awareness.
- Reconsidering in crop pattern.

### Recommendations:

To overcome the groundwater crisis, Iran Water Recourses Management Company has proposed 12 procedures on *"Groundwater Resources Management."*

### **Procedure No1: Organizing Water-Wells Drilling Companies.**

- Increasing scientific level of water-wells drilling companies personnel.
- Ranking the water-wells drilling companies.
- Supervision on water-wells drilling co. by private sector.
- **Providing I.D. Cards for water-wells.**

### **Procedure 2&3 on Groundwater resources**

- 1- Describing responsibility of water crisis staff province.
- 2- Identifying the situation of unpermitted and over-exploited water wells.
- 3- Personnel encouragement.
- 4- Implementing water optimum use regulation.
- 5- Investigation on groundwater research.

Procedure 4: Establishing equilibrium of groundwater supply and demand:

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- Establishing and maintaining governance functions;
- Financing the required budget of Water Authorities Company;
- Implementing the Law of Optimum Water Use.

Procedure 5: Installation of Intelligent Water and Power Counters:

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- ❖ Feasibility Study;
- ❖ Manager & Clients;
- ❖ Production Phases;
- ❖ Installation and Services.

**Procedure 6: Propaganda and feedback relevant to groundwater users:**

- ◆ **Providing and showing animation on TV;**
- ◆ **Providing and distributing training pamphlets;**
- ◆ **Holding seminars and workshops;**
- ◆ **Public awareness through radio & television, newspapers and magazines;**
- ◆ **Information feedbacks.**

**Procedure 7: Software Integrated management on groundwater resources**

- **Using VPN System for the integrated software of Regional water Companies and affairs;**
- **Facilitating up-to-date data accessibility by VPN system to prepare daily performance reports, to maintain electronic communications, and to supervise water affairs between the headquarters and Regional Water Companies.**

## Procedure 8: Application of GIS in Protection and Operation of GWR

- Feasibility study on the planned area;
- Using the required data of protection and operation of groundwater resources on GIS maps;
- Monitoring and supervising the performance of protection and operation of groundwater resources in IRAN.

## Procedure 9: Water Users Association on Protection & Maintenance of GWR

- ❖ Establishing the Organization of WUAs;
- ❖ Establishing functions and responsibilities of the Ministry of Energy relevant to WUAs;
- ❖ Establishing the functions to be delegated to WUAs;
- ❖ Establishing and maintaining the factors and motives to strengthen WUAs.

## Procedure 10: Comprehensive Water Law

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- Establishing pros and cons of fair distribution of water and execution code in chapter two;
  - Reforming the articles of fair distribution of water;
  - Proposing new complementary articles regarding integrated management on water resources.
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## P. 11: Training Courses for the personal of protection and operation affairs GWR

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- ✓ Promoting the scientific and efficiency level of the relevant personal.
  - ✓ Acquainting them with the new sciences, technologies and managerial methods.
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## Procedure 12: Supervision on Regional Water Companies

- Performance Assessment of groundwater management;
- Highlighting the results of the GW monitoring/ reviewing existing problem and challenges;
- Summarizing the results of monitoring groundwater resources to the ministerial levels (Every 3 month).



Thank you for your attention