

THE TRADITIONAL AFLAJ IRRIGATION SYSTEM FOR THE SUSTAINABLE MANAGEMENT OF WATER IN OMAN

In the Sultanate of Oman, [the traditional Aflaj irrigation system](#) continues to be used and maintained to assure a sustainable management of the precious resource represented by water. Each *Falaj* system (*Aflaj* is the plural and refers to the whole system) is based entirely on the natural flow of water. It consists of tapping substantial underground water resources, springs or surface water and conducting the water by gravity alone often over long distances, to towns and villages where it is distributed to domestic and agricultural users.



Oman has one of the oldest functioning water systems in the world.

The *Aflaj* system in Oman is one of the largest concentrations of Falaj irrigation systems in the world: over four thousand systems have been identified in a large-scale survey completed in 2001 by the Ministry of Regional Municipalities, Environment, and Water Resources. Around 3,000 of these systems are still functioning.

The origins of this system of irrigation may date back to AD 500, but archaeological evidence suggests that irrigation systems existed in this extremely arid area as early as 2500 BC. This ingenious technology for water acquisition built by rural communities has been adopted in more than 34 countries and continues to provide reliable supply of water for human settlements and irrigation in hot, arid and semi-arid climates. It is known as falaj in Oman, khattara or foggara in North Africa, karez or kanerjing in the northwestern desert of China, and karez in Afghanistan, Pakistan and Central Asia.

In Oman the Aflaj system includes three different types of technologies, on the basis of their structure and water source: the *Dawoodi Falaj*, underground channels that have vertical access shafts that can be as deep as tens of meters, allowing to store water all year; the *Ayni Falaj* that collects water from springs; the *Ghaili Falaj* that draws supplies from natural resources such as ponds or lakes and is used more during times of increased rain.

These ancient engineering technologies demonstrate long standing, sustainable use of water resources for the cultivation in extremely arid desert lands. The Omanis built these watercourses tapping into springs on the mountain slopes, digging tunnels by hand to reach underground water sources and capture what flowed from the rocks and earth. They built channels with stones and mortar to carry the water downhill to their homes and terraced fields. These water systems still underpin agricultural systems across a large area of the country.

The survival of these water tunnels and canals makes them a widely treasured piece of Oman's national identity, and one of the hydrological wonders of the world. To protect and strengthen this heritage, the Sultanate of Oman has decided to present the proposal to recognize it as a World Heritage. In 2006, UNESCO recognized five of these canals -



Falaj Al-Khatmeen, Falaj Al-Malki, Falaj Daris, Falaj Al-Mayassar and Falaj Al-Jeela - as part of the [World Heritage List](#). These sites have been chosen to represent the sophistication and technological achievements of the total Aflaj working irrigation systems in Oman. The [Nomination text published in the UNESCO webpage](#) presents the main characteristics of the five recognized Falaj systems and their management methods.

The nominated sites include the underground channels which run between the mother well, spring or wadi (surface water) where the water is tapped, to the distribution network above ground through channels around the plantations and within settlements and associated buildings, such as mosques and houses. Watchtowers built to defend the water systems form part of the sites reflecting the historic dependence of communities on the Aflaj system.

The organization of the water distribution systems is an outstanding example of a traditional structure which continues to play a vital role in society. The success of the *Falaj* systems depends on the social and economic structures which underpin it and have done for centuries. These are rooted in local communities and guarantee fair shares to stakeholders. The system is based on a traditional system of time-sharing that is passed from one generation to the next.

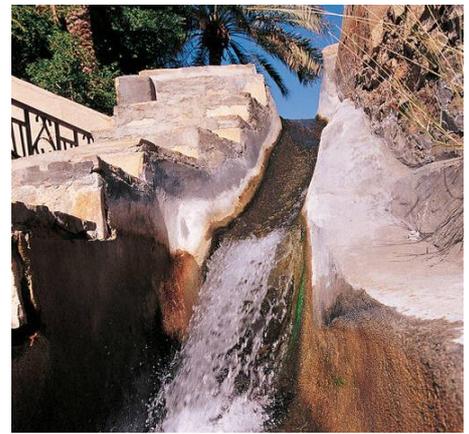
During the last decades the increased development in Oman, including smaller towns and villages, has led to increased demand for water and compromised some of the settings of the Falaj systems. In many areas the water is brought to the surface through large wells dug at great depth, affecting the level of underground water supplies. Palm plantations have been replaced by new houses. Road construction has also affected the water channels and some new roads are built next to open channels or cut across the underground channels. The exodus of people from rural areas has contributed to damage the functioning of many systems due to the lack of local maintenance and care.

However, despite the transformations generated by modern development trends, the traditional Aflaj water system continues to play an important role in Oman. It is estimated that, with 3,000 already active Falaj systems, it accounts for thirty percent of Oman's groundwater, and is thus crucial to water management for communities and agricultural production in the country.

Since the Ministry of Regional Municipalities and Water Resources assumed responsibility for the maintenance of the underground *Aflaj* channels in 1981, many hundreds of kilometres of channels have been restored. Communities carry out regular monitoring of their *Falaj* systems and submit requests for assistance in maintenance or conservation whenever their structural or hydrological structures are affected. The Ministry prepares technical specifications and drawings, supervises the maintenance work and also financially supports the implementation of projects. [The preservation of the Aflaj System](#) is part of the policies and actions planned by the Ministry of Regional Municipalities and Water Resources to meet the challenges of the 6th Sustainable Development Goal by 2030.

The Ministry of Health in its [Health Vision 2050 and National Plan](#) mentions the conservation of the Aflaj system in its priorities. The website of the [Ministry of Tourism](#) values the original Omani irrigation system, deep-rooted in the country's land and history.

The Aflaj Research Unit Implemented by the [University of Nizwa](#) is one of the important projects currently underway to document the multi-faceted contribution of the Aflaj system to traditional knowledge, culture and heritage, biodiversity, and the economy of Oman. The University is



involved in projects to highlight the importance of the Aflaj to Oman's communities, by engaging them through educational programs, social media, and the production of literature, video, and other materials. Their vision is to identify the contributions of this technology and the threats it faces in order to develop plans to ensure the sustainability of the Aflaj System for the future.

The challenges posed by climate change to the entire planet and all territories, and the global initiatives taken by the international community to promote a transition towards more sustainable development methods in all fields, today attach great importance to the recovery and enhancement of ingenious and ecological solutions created in the past like Aflaj systems for the sustainable management of an essential natural resource such as water, for the benefit of all.

To know more

[UNESCO World List](#)

[Nomination text published in the UNESCO webpage](#)

[Aflaj in worldheritagesite.org](#)

[Aflaj in artsandculture.google.com](#)

[Aflaj in ancientwatertechnologies](#)

[Aflaj in patrimoinedorient.org website](#)

[Aflaj in Medomed.org website](#)

[Aflaj in arcgis.com website](#)

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